Texas A&M University

Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

Foundational Component Area: Life and Physical Sciences

In the box below, describe how this course meets the Foundational Component Area description for Life and Physical Sciences. Courses in this category focus on describing, explaining, and predicting natural phenomena using the scientific method. Courses involve the understanding of interactions among natural phenomena and the implications of scientific principles on the physical world and on human experiences.

How does the proposed course specifically address the Foundational Component Area definition above?

HORT 201 Horticultural Science and Practices surveys the basic biology of plants (anatomy, morphology, physiology, life cycle), environmental sciences (water, light, temperature, soil, atmosphere, nutrient elements) and biotic factors (pests) that impact the growth, development, productivity and aesthetic value of horticultural crops, e.g. fruits, vegetables and ornamental crops. Each topic begins with the fundamental scientific basis of the topic and, where appropriate, explain the scientific method used to develop the conclusions, then progresses to the impacts on plants and/or the environment, then the practical applications on horticultural crops.

Core Objectives

Describe how the proposed course develops the required core objectives below by indicating how each learning objective will be addressed, what specific strategies will be used for each objective and how student learning of each objective will be evaluated.

Critical Thinking (to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information):

How Addressed
Students will develop critical thinking skills through integration of “structure-function” relationships, “cellular physiology-whole plant relationships”, “environment-plant” interactions, or deduction of causal effects from symptomology.

Strategies
Each topic will begin with scientific background, followed by how this relates to environmental and/or biological effects, then practical applications. Examples would be:
Lectures on water would begin with the physical chemistry of water, such as the principle of heat of vaporization, which will be followed by lecture on water movement through plants and out of leaves by transpiration. Then the class would dialogue about how this explains why a plant can does not overheat in full sun in the middle of a hot August day in Texas. Another example would be lecture on the light absorption spectrum of chlorophyll and the light emission spectrum of artificial lights, then question the class “What is the best artificial light source under which to grow plants indoors and why?” In addition, this approach is used to promote critical thinking outside of class by simply ending the photosynthesis and respirations lectures with a take-home question such as: “If you went home tonight, put your focus in a plastic bag, exhaled into the bag, then sealed the bag with a bread twist tie – would the plant’s photosynthesis increase or not?” The next lecture would start with students discussing the answer. This might be followed with a question such as, “Could you do the same thing and make your salad last longer when stored in your refrigerator?” I call these “Food for Thought” questions to stimulate critical thinking both inside and outside the classroom. As the lectures progress through the semester and each new topic builds on and interrelates to the previous topics, the students would be able to critically evaluate how a certain plant STRUCTURE would impact certain plant FUNCTION(S) relative to control of water loss, increase/decrease of photosynthesis, anatomical basis of asexual propagation, hormonal control of growth, crop productivity, etc.
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How evaluated
Each exam will have questions formulated to test for the ability to answer these “Food for thought” type questions.

Communication (to include effective development, interpretation and expression of ideas through written, oral and visual communication):

How addressed
Active learning is used in almost all lectures, which includes extensive question and answer dialogue with students during the class. Students will be given “Food for Thought” questions at the end of most lectures, and the class will verbalize answers/solutions at the beginning of the next lecture.

Strategies
Students will be given “Food for Thought” questions at the end of most lectures, and we will spend the first few minutes of the next lecture verbally discussing the class answers. Or, questions will be raised during the lecture. Questions about controversial issues will be used to stimulate self reflections then dialogue, such as “We have been cloning plants for centuries without controversy, so why is the recent cloning of animals so controversial?” More often than not, the Food for Thought question would come from a newspaper headline, nightly news or 60 minutes episode on topics such as cloning, climate change, water restrictions, loss of habitat and biodiversity, oil spills, nitrate pollution from agriculture, how will plants repopulate after recent forest fires, etc., especially as these factors relate to the urban and home landscape - the new American farm is your interscape and your yard. This is an effective approach to get students to express themselves; the timid student my chime-in on a topic they are passionate about. Also, it applies their education to the real world.

How evaluated
To make sure the student can independently express ideas, exams will be used to test the student’s ability to express concepts, interpretations and personal views in writing. The grade may not be based on whether or not the answer is right or wrong, but rather was the answer to the point, clear and succinct.

Empirical and Quantitative Skills (to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions):

How addressed
In many of the topics, the scientific basis or horticultural application lends itself to quantitative or qualitative analysis. Examples would be, reasoning to diagnose causal abiotic and biotic stress from visual plant symptoms, deduce quantitative responses or induce trends from graphs, or solve fertilizer problems, etc.

Strategies
Students will develop basic empirical and quantitative skills in areas such as physical chemistry and environmental relations and how the heat of vaporization of water is used to determine the degree evaporative cooling by transpiration. Or practical applications, such as mathematically calculating the lowest cost fertilizer per unit nitrogen given the fertilizer analysis and mass of the bagged fertilizer. Students also will use reasoning to identify nutrient deficiencies from visual symptomology. Many of the relationships are presented in graphic form, thus the students learn how to read and interpret graphs. For example, students will use graphs to determine the light compensation point from plots of photosynthesis and respiration rates, and graphically observe how the light compensation point decreases as plants acclimate to low light interior environments.

How evaluated
Exam questions will be formulated to test the students ability solve problems, reason cause and effect, and interpret trends from graphs.
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Teamwork (to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal):

How addressed
The major pedagogical tool used in lecture is active learning, including active learning exercises with students. Food for Thought questions will be used to stimulate small groups discussions.

Strategies
Students will participate as groups in “active learning” exercises, such as using students to act-out electron and light capture by chlorophyll and resultant ATP synthesis in the electron transport chain of the light reaction of photosynthesis. “Think-Pair Share” or “Think-Group Share” will be used for active class participation on many topics.

How evaluated
I always formulate a question that can only be answered if one participated in or paid attention to the active learning exercise. This assures knowledge was gained from the activity.

Please be aware that instructors should be prepared to submit samples/examples of student work as part of the future course recertification process.