

Form for Interdisciplinary and Integrated Collaborative Teaching

“Collaborative”

Meaning and context: Teaching partners are expected to collaborate on (1) defining the objectives for the course, (2) putting together the course materials, (3) conducting the formal instruction of students, and (4) evaluating student performance. Note that courses in which one faculty member of record convenes the course and invites one or more guest speakers to take part in the class are not considered courses taught collaboratively. (Those courses may, however, utilize outside speakers when appropriate *in addition to* the primary faculty members of record.)

In the box below, list which two or more faculty members from what departments/units within which college(s) will engage in the interdisciplinary and integrated collaborative teaching. (This information should also be readily visible on the syllabus.)

Interdisciplinary teaching team:

1. 2 Faculty lead the course lectures, technical demonstration, and class discussion.
 - Amy Youngs, Associate Professor, Department of Art, College of Arts and Sciences
 - Iris Meier, Professor, Department of Molecular Genetics, College of Arts and Sciences
2. ½ time appointment GTA, Department of Molecular Genetics, to assist with hands-on science labs.

“Interdisciplinary”

Meaning and context: Participating faculty must be from *demonstrably* different disciplines, programs, or departments. (Think along the lines of Art & Molecular Genetics, Pharmacy & History, Public Health & Music, etc.)

In the box below, explain what the distinct disciplines and contributions of each faculty member are. Furthermore, explain where and how these will show in/contribute to the course GEN Theme. (This information should also be readily visible on the syllabus.)

This GE Theme course is a one-semester introduction to plant biology and art making disciplines combined with critical and creative practices in a biology lab and an art studio. We will perform scientific experiments, microscopy, staining, chemical analysis and related art experiments that lead us towards new, experiential understandings of plants and their relationships to humans. Students will investigate and observe plant cells and molecules to understand how they respond to their environments. We learn their strategies and solutions and resiliencies/tolerances with special consideration for the impacts of

climate change. We will investigate the human impact on plants and our own health, sustainability, and the lived environment.

The Art instructor engages students in class discussions, lectures, and analysis of related artists in the field, using critical and logical thinking to evaluate the current environmental climate and its impact on plants and humans. Instructor teaches artistic methodologies for understanding, analyzing, and presenting knowledge about plants' relationships to human and planetary health. Basic artistic techniques will be demonstrated such as software and hardware for creating art that illustrates, visualizes, or narrativizes their experiences.

- Studio art making (Hopkins Hall 356) - learning basic techniques for digital art making
 - o Microscopic photography with students' own smartphone cameras
 - o Applications of digital manipulation of microscopic imagery with Photoshop
 - o Video recording microscopy with smartphone cameras and apps
 - o Basic techniques for creating and editing time-based Images and Moving Images

The Molecular Genetics instructor will give lectures on basic knowledge of plant structure and function, growth and development, diversity, and issues in modern plant biology, which will help students cultivate an appreciation of plants and plant science, and raise awareness of human impacts on environments in our daily life. In the laboratory section, the instructor gives demonstrations and teaches principles of operating equipment and instruments, and teaches the principles of performing a well-controlled experiment, collecting, analyzing and interpreting data, and the difference between data and scientific knowledge. Also, the instructor guides students to use a lab notebook for recording data and observations from the experiments.

- Scientific experiences in a lab (Jennings Hall 010) - following lab protocols, learning and practicing microscopy, staining, and chemical analysis.
- Practice in managing a lab notebook - documenting experimental progress, procedures, data, analysis, observations, conclusions. This lab notebook is associated with Assignment #1, 'Group Scientific Presentation', and Assignment #2, 'Research Notebook' with developing visual techniques.

"Integrated"

Meaning and context: Interdisciplinary integrative teaching is different from multidisciplinary teaching where "faculty present their individual perspectives one after another, leaving differences in underlying assumptions unexamined and integration up to the students. In interdisciplinary courses [...] faculty interact in designing a course, bringing to light and examining underlying assumptions and modifying their perspectives in the process. They also make a concerted effort to work with students in crafting an integrated synthesis of the separate parts that provides a larger, more holistic understanding of the question, problem, or issue at hand." (Klein & Newell, 12)

In the box below, explain how the faculty members will be teaching the course together by being both present during all or most course meetings (at least 50% of the meetings) and bringing their different disciplines and perspectives into dialogue to address the GEN Theme. Exactly where and in what

manner will this happen? What kinds of assignments will the students produce that demonstrate their ability to integrate the different disciplinary questions, methods, or knowledge to address the GEN Theme at hand? Be specific. (This information should also be readily visible on the syllabus.)

This course offers an instructional format that integrates artistic and scientific disciplines. Students will investigate connections between art and science, micro and macro, plants and humans, local and global, anthropocentric and eco-centric. Through field trips, experimentation and research in science labs and art studios, students will gain an understanding of these relationships and synthesized approaches to examining our lived environments. Based on researching, understanding, and creating experiences in reflection assignments, students ultimately will develop and create artworks, which illustrate and implement the artistic and scientific concepts addressed in the course, synthetic ideas and perspectives, to be presented at the end of semester Art and Technology exhibition. Students' art projects and the exhibition platform provide educational outreach to the larger student community, promote the public awareness of valuable relationships between plants, humans, and the lived environment, and seek constructive feedback from our eco-friendly art and science communities.

The instructors bring expertise of their disciplines in art and science to the interdisciplinary teaching frameworks and protocols, which are integrated through hands-on learning practices in experiments and art making, group and class discussions, collaborations, peer reviews, reading, presentation, writing, reflection assignments, and creative projects.

Each instructor is present during all course meetings and participates in collaborative teaching and learning throughout the semester. During the science-focused lectures and activities, the art teacher is engaged in asking questions from their discipline's perspective. During the art-focused lectures and activities, the science instructor similarly brings their scientific perspective to the conversation. Interacting and communicating with "the other", as demonstrated and encouraged by the instructors throughout the course, teaches students to better communicate their own perspective and expertise and to actively work on comprehending and appreciating a less familiar perspective. Faculty work together to grade all assignments.

Students experience the similarities and differences in perspectives between artistic and scientific disciplines. Students learn to integrate and connect multiple approaches to understanding the lived environment, and they develop creative projects that allow them to materialize the concept of coexistence and alternative lived environments. Students will learn and practice artistic and scientific methods in distinct assignments and in integrated assignments.

The science instructor provides hands-on learning protocols in the lab to demonstrate how plants react to diverse environments, such as agricultural ecosystems caused by human intervention and stressful climate situations. For instance, in the lab experiment, "The Symbiosis Between Plants and Nitrogen-Fixing Bacteria", students cultivate their own plants in the greenhouse to observe symbiotic relationships between plant roots and bacterium (Rhizobium) for their mutual benefits of exchanging nitrogen and carbohydrates. Students will examine how fertilizer affects the nitrogen fixing symbiosis through the lab practices alongside logical thinking, observation, and data analysis. In an additional experiment, students investigate how temperature affects the rate of photosynthesis, measuring stomata under a microscope. These scientific examinations will allow students to understand how the plant systems are affected by environmental issues, such as global warming and human-caused climate change.

Furthermore, students will then interpret the scientific data they collected in the experiments and transform them in artistic visual representations and narratives. They will learn and use techniques, such as image manipulations, diagrams, mapping images, drawings, microscopic photography, video, and sculptural installations (see Assignment #2 and #3 below). Also, the art instructor leads class discussions of student works and peer reviews, following the course lectures, which help students critically evaluate and interrogate how literature and artists' professional practices have engaged with contemporary issues, and emphasizing the course's focus on the correlation between plants and humans for better understanding the lived environment.

Connections between plants and humans are examined through both scientific and artistic protocols, such as observation, speculation, synthesis, manipulation, construction, and presentation, and will be employed in the development and creation of art projects. Students will show their educational experience, reflection, and creative works in the Art & Tech exhibition that makes art communities and academics aware of the value of sustainable environments from the interdependence of human and plant systems as we cohabitate together and are being parts of the lived environment.

Based on those scientific experiments and artistic applications, students' investigations and articulations will culminate in the assignments and art projects below:

Assignment #1 (10 %) - A group scientific lab experience with lab protocols, analysis of data, and visual documents of experiments, such as microscopy and using imaging software for measuring stomata. Each group presents their scientific results in an oral and visual report. Must include 2 to 3 slides and microscopic photography. The science instructor leads a laboratory experience and teaches students scientific methods. Including data collection, measuring, procedures, observations, and experiment design.

The art instructor teaches students basic principles of photography and how they can use smartphone cameras and apps to connect with microscopes that digitize microscopic images and creative manipulations.

Assignment #2 (10 %) - 'Plant Noticing: Ways of Knowing, Ways of Showing, and Ways of Understanding'

This assignment accompanies "a plant noticing walk" on campus. Students use multiple methods of getting to know their chosen plant. In class, students will identify their plants and learn how to conduct a scientific literature search about them. Students develop a creative project to share their knowledge of their plant in a presentation and discussion for the next class period.

- The science instructor assists students to use multiple methods of knowing to explore a chosen plant in the greenhouse or on the walk. In class, students will identify their plants and seek scientific knowledge about them. Instructor demonstrates scientific literature search.
- The art instructor leads students in exercises demonstrating multiple methods of knowing through artistic strategies such as drawing, sensory experience, free writing, and recording. Students will synthesize their experiences by creating something of their own in response – a drawing, illustrations, creative writing, video, performance, or object.

Assignment #3 (10%) - Research Notebook

Students will make sketches, take notes, collect data, perform data analysis and statistical evaluation, and record their own reflection and observations - both scientific and artistic - during all aspects of the class. A physical or digital notebook format is submitted at the end of the semester.

Assignment #4 (20 %) - Making it Visible’ - Art assignment for digital image manipulation

Students will create photography or digital images that make an aspect of plant cells/cellular systems “visible” through their manipulation of microscopic images, drawing, painting, and moving images.

- Students will create an artwork or experience that makes plant cells “visible”
- Students engage in critical and creative thinking of how art represents and empowers the relationships between micro and macro, unseen and seen, situated and global, that would otherwise be invisible.
- Students will extend, augment, re-frame, re-map, and artistically grapple with how to reveal the smallest components of plants - cells.
- Students will create photography or digital images through their manipulation of microscopic images, drawing and painting, mixed media, as long as it is creatively engaged in the topic.

Final Project #5 (35 %) - ‘Speculative Fiction for Plants and Humans’- Group art project

Students’ creative visualizations and narratives about the course theme will be articulated in various art forms, such as graphic novels, digital images, projection of moving image / video art, installation, which will be exhibited at the Art & Technology Student Exhibition at the end of semester. Each student will write a two-page paper, which states the final project concept, reference, content exploration, connections between the artwork and environmental issues.

- The final art project is to create art/science visualization with a creative narrative, based on our collective experiences and research. At the end of semester, students will exhibit their projects (prints of digital image, projection of moving image / video art, installation, or combination) at the Art & Tech show and the department’s Open House event.
- Students will write a short reflection paper about their experience and the connections between their artwork and course topic.

Participation (15%) – discussions, critiques, peer reviews, graded throughout the course.
