BIO 495 Carbon Awareness Partnership Service Learning** (3 credits)

Fall 2012 & Spring 2013 Instructor: Anne Wright

To serve as a Capstone Experience, this course must be taken concurrently with
BIO 477 Biology Capstone Experience (0 Credits)

**VCU Statement of Service-Learning: Service-Learning at Virginia Commonwealth University is a course-based, credit-bearing educational experience in which students participate in an organized service activity that meets community-identified needs. Students reflect on the service activity to increase understanding and application of course content and to enhance a sense of civic responsibility.

Course Description: Carbon Awareness Partnership (CAP): Research and Outreach investigations in terrestrial and aquatic carbon movements and recycling.

Carbon emissions and transformations are of growing concern worldwide as levels of carbon dioxide, methane, and dissolved organic carbon increase in our atmosphere and aquatic habitats. Understanding the carbon cycle and its regulatory processes is imperative in preparing the next generation to deal with the future effects of carbon fluctuations. VCU's Carbon Awareness Partnership (CAP) offers undergraduate students a dynamic **CAPSTONE EXPERIENCE** combining **RESEARCH** and **SERVICE LEARNING**.

RESEARCH: During the semester, students will work closely with Biology graduate students to develop background knowledge on carbon cycling through lecture, reading, and group discussion. They will practice current research methodologies by collecting samples and data from forests and mesocosm arrays at the VCU Rice Center and at participating schools. They will conduct a carbon consumption experiment in the laboratory and analyze their results, drawing comparisons to contemporary carbon cycling research and the role of recycling in reducing CO_2 emissions. As final products, the students will develop presentations and a poster summarizing their experiment, conclusions, and reflections on the program.

SERVICE LEARNING: Understanding how carbon moves within our world and the roles photosynthesis and respiration play in the carbon cycle are challenging concepts to explain effectively at the secondary school level. There is an identified need for interactive, hands-on curricula that 1)engage high school students in scientific methodology and experimentation, 2) clarify the interplay of these fundamental processes, and 3) increase student literacy in the sciences. Undergraduates will apply their carbon knowledge by leading high school students from selected regional school systems in a two-day CAP carbon cycling module. The module consists of:

- an interactive introduction to carbon cycling, photosynthesis and respiration
- a research experiment following the scientific method
- a data analysis exercise using collected data.

Undergraduates will leave CAP with skills in

- presentation
- data collection and analysis
- research and curriculum development
- basic scientific knowledge and teaching experience
- a poster or presentation for the student's resume

Course Objectives:
Participating undergraduates will develop an integrated understanding of carbon cycling by working collaboratively with graduate students and regional high schools on a multifaceted teaching module that combines contemporary research with carbon awareness. This unique program will expose students to current challenges faced by scientists studying carbon cycling and global change and the challenges associated with teaching complex scientific concepts in the secondary classroom. Participants will: be introduced to contemporary scientific literature concerning carbon cycling and educational research; gain valuable experience conducting a research experiment that follows the scientific method; input, manipulate, analyze and graph data using Excel; and improve their presentation and teaching skills. Students will collaborate with high school teachers, Central VA Waste Management Authority, and the CAP program managers to develop new carbon curricula and recycling initiatives that reduce the carbon footprint at participating high schools. Our objective is to increase scientific literacy on current environmental issues in a broad and diverse audience.

Course Syllabus:
Weekly 2 hour classes (Day and time TBA)
Aug 23 – 31
Class 1: Introductions, Syllabus Review, Course Objectives
Student Pre-Assessment
Carbon Cycling Basics: Photosynthesis and Respiration in Terrestrial and Aquatic Environments
Reading- one carbon paper, one education paper
Reflection Journal
Blog

Sept 3-7
Class 2: CAP Carbon Cycling lecture
Experiment at Rice Center
Reading- *Developing a Multi Year Learning Progression for Carbon Cycling in Socio-Ecological Systems*, Mohan et al, 2009
Reflection Journal
Blog

Sept 10-14
Class 3: Lecture: '*Misconceptions and discourse*', SOE faculty lecture
Reading-Student selected carbon cycling education paper & classroom activity—provide written summary
Reflection Journal
Blog

Sept 17-21
Class 4: Student Dry Run of class-room activities

Preparation for interactive discussion, field collection, and experimental set-up
Blog

Sept 24- 28
Class 5: Student Dry Run of class-room activities
Presentation by Central VA Waster Management Authority (CVWMA): '*Recycling and Carbon Reduction: What You Can Do Now!*'
Preparation for school trips, discussion of education paper/activity, recycling at schools
***Mid-Term Reflection** on CAP preparation
Blog

Oct 1- Nov 9
Classes 6-11: Undergraduates lead interactive discussion/field collection with their paired schools at Rice Center or on school grounds
Data analysis preparation and execution at schools
Recycling Presentation by CVWMA at schools
Timing will depend on class schedule and meeting times with high school
Service Hour Log book
Blog
Reflection Paper: Students will reflect on their learning, teaching, sampling, and data analysis

Nov 12- Nov 30
Classes 11 & 12
Wrap up data analysis visits that have not been completed
Student contribution to CAP curricula (citing primary literature)
Final Reflection
Blog
Class Poster

Dec 3- Dec 7
Class 13
Wrap up discussion
Final Blog
Final Class Poster
Submit Reflection Journal
Student Post-Assessment