Solstice: an interdisciplinary approach to the science and civic issues of our Chesapeake Bay

SCED 495 and SCED 595 - Summer 2011

COURSE FACULTY

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COURSE DEVELOPMENT NOTE

This syllabus is intended to convey the key aspects of this course and the overall Solstice experience. It is not yet in a format appropriate for consideration in internal curriculum review processes or by our accrediting body (SACS).

COURSE DESCRIPTION

In this special topics course, students will engage in an inquiry-driven investigation of key conservation challenges of the Chesapeake Bay. Students will develop relevant scientific questions, identify appropriate methodological approaches to address those questions, analyze their findings, and present the project at a campus-wide event. Throughout the process, learning activities will model the eight components of Meaningful Watershed Educational Experiences (MWEEs), and students will consider pedagogical approaches to structuring MWEEs for students in their own classrooms. Further curricular applications will be made through the introduction of national curricula, such as Project WILD Aquatic and Project Learning Tree, and state curricula, such as Virginia's Water Resources.

This is a four-credit lab science course, and participating students should have completed at least one of their Liberal Studies science courses or General Education Goal 6. The course will also be one of four Chesapeake Bay Academies offered in Virginia in 2011.

COURSE FORMAT

This course will be taught in a hybrid-online format in late summer 2011, specifically during the last week of the campus' second summer session and the three weeks of third summer session. A preliminary outline of each week's activities is provided below.

Week 1 – Foundations (distance-delivery format; internet access required)

- Critical background readings and online discussions
- *Poisoned Waters* documentary
- Development of "ideas of interest" that may develop into research questions
- Planning and preparation for the field component

Week 2 – Field experiences at the water's edge (residential format at Hull Springs Farm, hereafter HSF)

- Inquiry investigation
    - Development of research question
    - Introduction of key equipment, methods of measurement, and observation skills
    - Quantitative way of thinking
    - Execution of research project
- *Bay as Text* activities
    - Field explorations at HSF
    - Excursion to oyster-processing facility
    - Interactions with watermen
- Classroom connections
    - NOAA curriculum materials
    - Other national and state curriculum models such as Healthy Water, Healthy People; Project WILD Aquatic; Project Learning Tree; Virginia's Water Resources; etc.

Week 3 – Field experiences in the watershed and lab experiences (commuter format using the Longwood campus; on-campus lodging option available)

- Inquiry investigation
    - Data analysis
    - Spatial data
    - Development of project presentation
- *Watershed as Text* activities
    - Waste water treatment plant visit

    - Drinking water plant visit
    - Forested landscape exploration
- Classroom connections

    - National and state curriculum models such as Healthy Water, Healthy People; Project WILD Aquatic; Project Learning Tree; Virginia's Water Resources; etc.

Week 4 – Synthesis (distance-delivery format; internet access required)

- Critical readings and online discussions
- Finalization of the inquiry project presentation
- Civic engagement component

Bay Academy Research Conference (date to be determined; on the Longwood campus)

- Poster presentations – campus-wide invitations
- Facilitated classroom activities by pairs of teachers and teacher candidates

COURSE GOALS

Students will:

- Develop an understanding and appreciation of the complex scientific and civic issues of the Chesapeake Bay through readings, field experiences, and scientific inquiry.

- Identify a relevant and interesting scientific question and carry out a field-based investigation of that question.

- Apply and practice methodologies from various STEM fields, including biology, chemistry, geography, environmental science, physics, and mathematics, such that they understand the use of key equipment, the systematic recording of measurements, and the important role of observations in reaching data-based conclusions.

- Consider appropriate quantitative analyses for their own data and evaluate the way in which quantitative approaches are applied by other researchers.

- Visit and explore sites and projects with direct bearing on the health of the Bay and its associated human communities, such as protected areas, Bay-based industries (like oyster-processing plants), habitat restoration projects, waste water treatment plants, and others.

- Reflect on the meaning of field experiences and scientific investigations, both in regards to the scientific context and the economic and social contexts of the Bay and its watershed.

- Participate in Meaningful Watershed Educational Experiences, which

    - are investigative or project oriented;
    - are richly structured and based on high-quality instructional design;
    - are an integral part of the instructional program;

- are part of a sustained activity;
- consider the watershed as a system;
- involve external sharing and communication;
- are enhanced by natural resources personnel; and
- are for all students.

- Develop a personal "library" of national and state-level curricula and practice with the application of selected lessons.

TYPICAL DAILY SCHEDULE – WEEKS 2 AND 3

Time period	Activity	Facilitators
Early morning	Breakfast and orientation to the day	Longwood faculty team
Morning period 1	Building foundations – conceptual grounding for the day's work	Longwood faculty team
Morning period 2	Field applications of today's concepts	Longwood faculty team and guests from natural resource agencies
Lunch and mid-day break	Casual discussion and sharing of ideas	None
Afternoon period 1	Inquiry project – exploring research questions	Longwood faculty team
Afternoon period 2	Perspectives – meetings with natural resource professionals	Guest speaker from natural resource agency
Evening (HSF only)	Dinner and group discussion	Longwood faculty team

EXAMPLES OF SPECIFIC 'BUILDING FOUNDATIONS' ACTIVITIES

From Dr. Suzanne Donnelly – Activities to explore Physical Science-related SOL topics

I will facilitate an activity on the physics of waves as it relates to erosion, particularly in regards to shorelines. Participants will build mini wave tables and/or another physical model of erosion to take home with them. This activity will provide conceptual linkages to the use of modeling in science in general. I will build that link with an interactive activity employing Monte Carlo simulations (used often in physics to model systems with large data sets and millions of degrees of freedom).

This examination of erosion from a purely scientific perspective will then dovetail into a critical look at erosion from social and ethical perspectives. Some questions that will lead to a rich discussion may include: can a natural process be inherently bad? Should we do anything to stop the erosion of the shoreline? Would there be any unforeseen consequences if we were able to find a way to prevent the shoreline from eroding?

As the cycling of energy is a fundamental process in all living systems, I will also facilitate activities that focus on the conservation of energy, a topic we will develop early in the students' experience. The conservation of energy will necessarily lead into work with energy conversion and on to energy conservation. It will be interesting to engage participants the question of how HSF could "go greener" in terms of its energy consumption. We will ask them to do some research about solar power, wind energy, biofuels, etc. and write a persuasive piece (to be included as an artifact in their portfolios) in which they make an argument about which one they think would make the most sense for HSF and why.

From Dr. Kelsey Scheitlin – Activities to explore Earth Science- and Geography-related SOL topics

A key focus will be the development of the participants' understanding of climate – both from a regional perspective and from a very local (microclimate) perspective. We will set up weather stations to record measurements of climate variables for 24-hour periods or longer. We will then analyze our field data using ArcMap or preferably Google Earth, as it is available to everyone. In examining our data, participants will consider the distance of the weather station from water, the effect of time of day, and the effect of landuse on climate variables.

From Dr. Mark Fink – Activities to explore the Life Science- and Natural Resource-related SOL topics

Longwood University has an on-going research effort at HSF examining the effect of the establishment of Living Shoreline (LS) technologies on aquatic communities. Undergraduate researchers collected data prior to the establishment of LS sites, and they are involved in an annual effort to document post-establishment community attributes. In the Solstice project, we will introduce teachers and teacher candidates to this project, its financial supporters (i.e., NOAA and DEQ), and discuss the rich and complex interdisciplinary connections this project presents (e.g., the links to the physics of erosion processes, to the economic issues of shoreline management, to the challenges faced by watermen, to the ecological cycles and trophic webs of the Bay, etc.)