Integrating Field-Based Service-Learning into an Introductory Hydrology Course

John G. Van Hoesen, Department of Environmental Studies, Green Mountain College, One College Circle Drive, Poultney, VT 05765, vanhoesenj@greenmtnu.edu

BACKGROUND:
Students in introductory hydrology courses are typically required to engage in a number of field-based laboratory exercises. Often, these exercises merely help students understand the process of data collection, gain proficiency with field equipment, and ask for rudimentary interpretations of the data. The establishment of a service-learning component to any geology course provides students with a greater understanding of the "need" for data collection and contributes to their engagement in the exercise by giving them an answer to question so often asked: "What am I ever going to use this for?"

During the spring 2004 semester, students at Green Mountain College enrolled in an introductory hydrology course collaborated with fellow students in an introductory chemistry class on a service-learning project. The students were responsible for establishing a long-term monitoring project along Poultney River in east-central Vermont working with the Poultney Mettowee Watershed Partnership (PMWP), a local non-profit conservation group. In collaboration with the PMWP, four sites were established for long-term monitoring.

Students in the hydrology course were required to: (1) survey the cross-sectional morphology of the stream channel (2) collect pebble counts above and below the cross-section, (3) collect GPS coordinates for the monitoring sites and backستان monuments used for surveying (4) collect discharge measurements along the cross-section, (5) provide a detailed sketch of the river and surveyed area, and (6) provide graphs of cross-sectional morphology and pebble counts for each site.

Students in the chemistry course were responsible for: collecting (1) conductivity, (2) pH, (3) temperature, (4) hardness, and (5) alkalinity, and water samples sent to the DEC State lab for total phosphorus, total nitrogen, E. coli, and chlorophyll a.

In addition to achieving the traditional goals of familiarizing students with field equipment, feedback from the students was positive and genuinely interested in the results because they felt they had actually "contributed to society," rather than just completing the lab for a grade.

LEARNING GOALS:
- Content or Concepts
  - Fluid processes of meandering streams
  - Grain size variability in fluvial environments
- Geologic Skills
  - Stream surveying using a total station
  - Stream gauging
- Higher Order Thinking Skills
  - Interpreting stream cross sections
  - Interpreting Microsoft Excel plots
- Other Skills
  - Writing site descriptions and drawing field sketches

MATERIALS, DATA, TOOLS, AND LOGISTICS:
- Special Tools/Equipment
  - This exercise requires a total station (a Topcon GTS-212 was used for this lab). A transit would suffice, but fewer cross-sectional profiles will be obtained.
  - This exercise requires a high-resolution GPS (a Trimble GEO XT with beacon-on-a-belt and Pathfinder Office was used for this lab).
  - This exercise requires a means of measuring stream/river discharge (an Ohio Digital Stream Flowmeter was used for this lab).
  - This exercise also requires the standard equipment for measuring streamflow and cross-sectional and morphological profiles (e.g. compass, tape measure, waders, rangefinders, calipers).

- Logistical Challenges
  - There are a number of challenges when trying to establish a long term monitoring project within an undergraduate hydrology course:
    - Steep learning curve for students at any level could utilize a field-based service-learning module.
- Context:
  - Instructional Level
    - This course is taught at an environmental liberal arts college attended exclusively by undergraduate students. However, courses at any level could utilize a field-based service-learning module.
  - Required Skills
    - Students must be comfortable with computers
    - Students must be proficient with Microsoft Excel
    - Students must have been exposed to stream gauging
    - Students must be familiar with concepts of GPS
  - Course Logistics
    - This exercise is used as a field-experience that integrates concepts from class lecture and previous laboratory assignments.

STUDENT ASSESSMENT:
Students were asked to complete a reflection/evaluation form regarding their experience with a lab that includes a service-learning component. This form asked the following questions:

- What was your general impression of this lab, and how could it have been made better?
- Do you feel you made a contribution to the community in any way?
- Compare this lab with other labs from this class or other classes that didn't have a service-learning component.
- Please rate the following statements using the following rubric (1 = strongly agree, 2 = agree, 3 = somewhat, 4 = disagree, and 5 = strongly disagree):
  a. I was outdoors.
  b. I was integrated with another course.
  c. I liked the field component.
  d. I provided help on experience
  e. I didn't enjoy the lab.

STUDENT FEEDBACK:
Students were asked to complete a reflection/evaluation form regarding their experience with a lab that includes a service-learning component. This form asked the following questions:

- 1. What was your general impression of this lab, and how could it have been made better?
- 2. Do you feel you made a contribution to the community in any way?
- 3. Compare this lab with other labs from this class or other classes that didn't have a service-learning component.
- 4. Please rate the following statements using the following rubric (1 = strongly agree, 2 = agree, 3 = somewhat, 4 = disagree, and 5 = strongly disagree):
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