Spatial thinking in 4-D: A project-based approach to link student-collected field data, GIS mapping, and archive research

GEOS 101-F15 Teaching team:
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Special thanks to:
GIS Magician - Carolin Fewerda
Archives Expert – Mary Yearl
Goals (from course syllabus)

1. Develop systems-level thinking skills and become users and creators of concept maps
2. Explore the connections between human activity and geological processes
3. Learn to make estimations and assess geological models in order to formulate your own opinions about key current issues

To achieve these goals you will learn to develop geological narratives. Narratives are authored by informed observers of the environment who collect data, use quantitative modeling, organize data to construct graphs with agendas, and synthesize separate lines of evidence to paint a holistic systems view of earth processes.
Course design to achieve goals

CONCEPTS AND PROCESSES
- Earth materials—rock formation (igneous, sedimentary, metamorphic) and weathering
- Geologic Time
- Stream Flow
- Groundwater
- Hydrosphere water budgets
- Plate tectonics as a major system control

APPLICATION: STUDY OF SEDIMENTATION IN PONDS ON CAMPUS
- Observation and description of ponds and surroundings
- Data collection via measurements of water quality and conditions
- Construction of maps
- Modeling of data (correlate variables, construct graphs and consider)

TOOLS
- Maps (topographic and geologic)
- Cross sections and stratigraphic columns
- GPS
- Stream flow meters
- pH and temperature probes
- Stream and Groundwater models
- Concept maps, graphs and diagrams

ORAL EXAM

RESEARCH POSTER

DEVILERABLES & ASSESSMENT
Historical Map of Wellesley College – before Paramecium Pond (1912, 1916, 1921)
Wellesley College Plan for Arboretum and Botanic Garden – 1931

Wellesley College Archives (photo courtesy of Sophie Kerwin)
Student experiences:
1. Collection of spatially identified data using GPS
2. Plotting and contouring data to prepare bathymetric map
3. Drawing cross sections separated over time
4. Use tools to estimate sedimentation rates
Paramecium Pond Bottom Profiles
GEOS 101-F15

Estimated sedimentation rate: 3cm/year
Time until next dredging: < 10 years!
Challenges and Opportunities

1. Logistics of engaging 23 introductory STEM students (first years to seniors) in authentic research across two lab sections organized in three teams.

2. Sustaining motivations across the arc of the semester when expectation is science takes place in neatly offered three hour blocks.

3. Well-designed research can scaffold across years and result in significant outcomes that can inform how the college manages its landscape.

4. Early applied research experiences have been shown to aid in retention of URM students. As a community there is much room for improvement - Maps and GIS is one tool that may help!

To see how the narrative ends
Come to the poster session:
Dec 7th 9:50 OBS 112