Authentic Community-Based Projects with Student-Collected Data: An Urban Perspective

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Objectives of this Presentation:

- Provide an urban perspective on geoscience education
  - What motivates an urban student?
  - How can we play on their strengths?
  - What is logistically feasible?
Objectives of this Presentation:

• Summarize insights from educational researchers
  
  – What insights can we glean from our colleagues in Schools of Education?
Objectives of this Presentation:

• Provide a case study of our efforts at Brooklyn College to integrate place-based student-driven data collection into our geoscience curriculum, beginning at the freshman experience

  – What was our thought and planning process?
  – What has been the initial response been from students and faculty?
Course Design

- Design method followed principles described in “Designing Effective and Innovative Courses” workshop by Barb Tewksbury and Heather MacDonald (2005)
  
  http://serc.carleton.edu/NAGTWorkshops/coursedesign

- Design team included a broad set of stakeholders
Course Design

- Know your audience
Brooklyn College Environment…

**The Students**

- Majority of BC students are first generation college attendees
- Approximately half of BC students have household income < $25,000
- Approximately half of BC students work > 20 hours per week

**CAREER** is very important to our students and their families!

No time for “busy work”
Brooklyn College Environment…

*The Students*

Three main career paths:
1. Environmental Geoscientist
2. Earth Science Teacher
3. Graduate School

Need to offer curricula that prepare for all three potential paths
Brooklyn College Environment…

The Students

• COMMUNITY is a unifying theme for a diverse population
Course Design

- Know your audience
- Know your limitations and resources
Brooklyn College Environment…

The Limitations

• Underfunded… expensive teaching equipment is unavailable

• After class activities are difficult to schedule

• Students do not have transportation

• Need to balance environmental and geological sciences
Brooklyn College Environment…

The Resources

- Research-grade analytical equipment available (e.g. SEM, XRD)
- Well equipped with computer labs (e.g. GIS)
- Great public transportation system
- Many community partners, parks, and museums
Course Design…

- Know your audience
- Know your limitations and resources
- Place goals first and content last
Essential Design Principles for a New Freshman Geoscience Curriculum

• Introduce fundamental career-related skills
  – Career preparation is a priority for most immigrant families and first-generation college students
  – Family exerts a strong influence on educational choices of such students

Quantitative Reasoning, GIS, Spreadsheets, Presentation Skills, Teamwork
Essential Design Principles for a New Freshman Geoscience Curriculum

• Provide an authentic urban geoscience experience
  – Urban students are likely to devalue course work that they perceive to be contrived
  – Urban students perform best when presented with open-ended problems

What would an urban geoscientist do?
Pollution, Erosion, Urban Planning
Essential Design Principles for a New Freshman Geoscience Curriculum

• Focus on local issues and resources
  – Classrooms in diverse urban settings often have nothing in common but the local setting in which they live
  – Local issues that potentially affect their families provide personal motivation

Health Issues, Environmental Justice
Essential Design Principles for a New Freshman Geoscience Curriculum

- Involve the community
  - Ethnic students require science career role models who “look like their parents”
  - Colleges are perceived as being “in the community but not of the community”
  - May provide volunteer and internship opportunities

Environmental Advocacy Groups, Neighborhood Development Organizations
So…
What Kind of Project?
What Kind of Data?
The Course Theme…
Air Quality in Brooklyn

• Visually obvious problem
• Can make personal connections
• Clear health link
The Course Theme…

Air Quality in Brooklyn

- Sampling equipment is relatively inexpensive, easy to use, and portable
The Course Theme…
Air Quality in Brooklyn

- Can use available research equipment, and that is relatively easy to operate
The Course Theme...
Air Quality in Brooklyn

- Sampling sites can be selected by students, do not need to be monitored by faculty, and can be revisited if necessary
  - Logistics and transportation are simplified
  - Students can maximize personal connection
  - Control given to students
The Course Theme…
Air Quality in Brooklyn

• Geospatial analysis and datasets can be integrated easily
Student Projects in Fall 2009

• Air Particulate Composition at a Residential Construction Site
• Air Particulate Composition in the Brooklyn College Subway Station
• Comparison of Air Particulates Upwind and Downwind of Industrial Hudson River
• Comparison of Air Particulates in Central and Coastal Brooklyn
• Air Particulate Characteristics with Respect to Relative Humidity
Types of Data Collected

- Particle sample characteristics
  - Abundance
  - Size Distribution

Excel, Basic Statistics, Graphing
Types of Data Collected

- Particle Compositions
  - Optical Properties
  - Composition by EDS

Technology, Graphics, Mineral Compositions
Types of Data Collected

- Particle Morphology
  - PLM and SEM

Technology, Graphics, Mineral Structures
Types of Data Collected

- Geospatial Data
  - Sample and Source Locations
  - Wind Direction

GPS, GIS, Maps
Types of Data Collected

- **Weather Conditions**
  - Wind Speed and Direction
  - Relative Humidity
  - Temperature

Graphs, Weather, Compass
Immediate Benefits

• Increased engagement in freshmen

• Freshmen thinking of themselves as scientists

• Improved relationships with community partners

• Increased support from Dean’s Office
Anticipated Benefits

• Increased number and quality of undergraduate research projects

• Increased summer employment of students in geoscience

• Improved technical, quantitative, and communication skills in upper-level students
Planned Revisions

• Team-teaching model will be implemented: one geologist and one environmental scientist

• Increased cohesion between student projects. Student lead in project selection will be maintained.

• Final presentations will be hosted by a community partner

• Expansion of design-team for revisions
Potential Pitfalls

• Lack of faculty buy-in due to reduction in content
  – Majority of faculty (and chair) must be on-board

• Instructor dissatisfaction due to loss of control
  – Careful selection of instructors

• Student dissatisfaction due to non-standard course delivery, or loosing sight of the big picture
  – Emphasis on marketability; Constant reassurance, shepherding, and report-outs