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

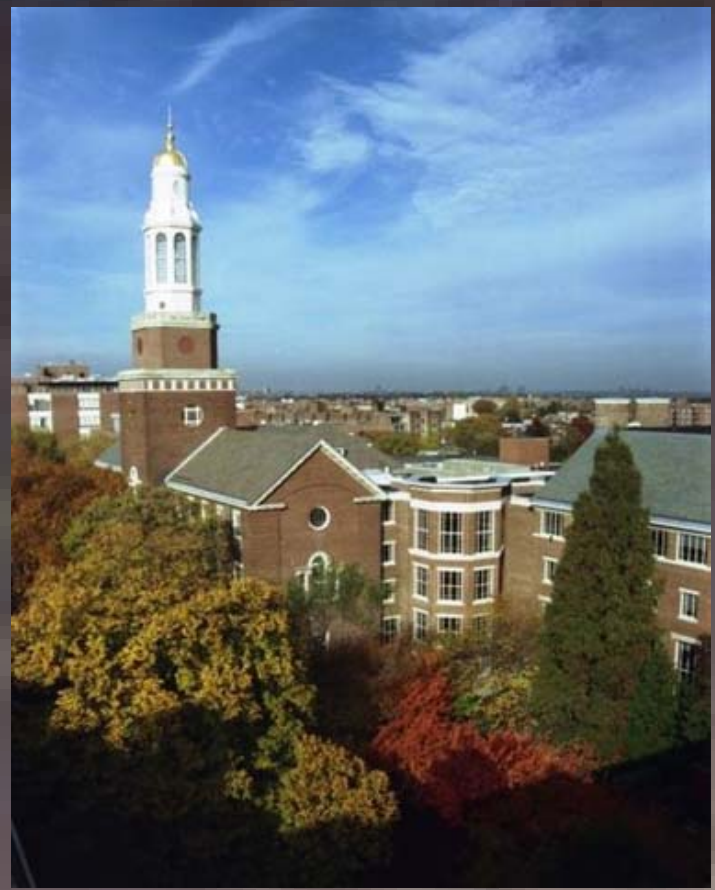
Brooklyn College Environment…

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”



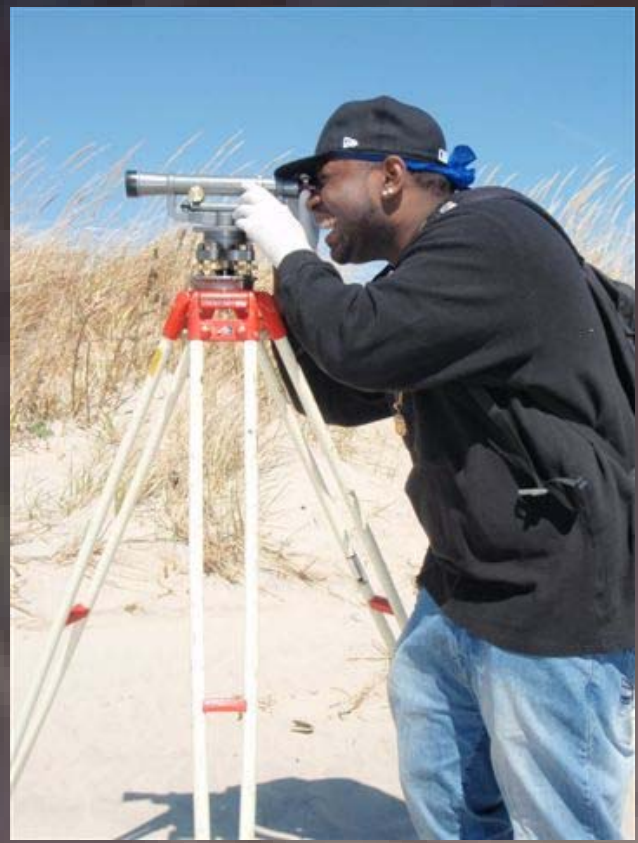
Brooklyn College Environment…

The Students

Three main career paths:

1. Environmental Geoscientist
2. Earth Science Teacher
3. Graduate School

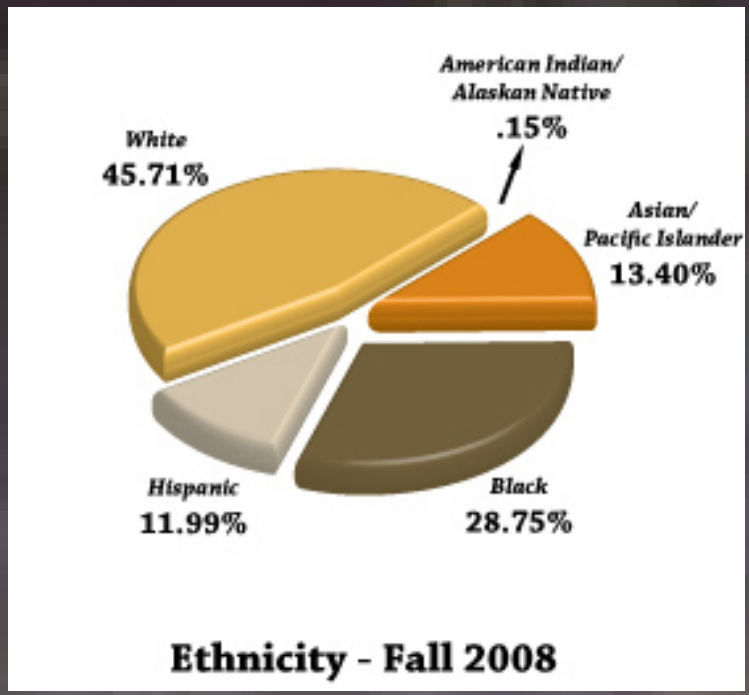
Need to offer curricula that prepare for all three potential paths



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 perceive 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

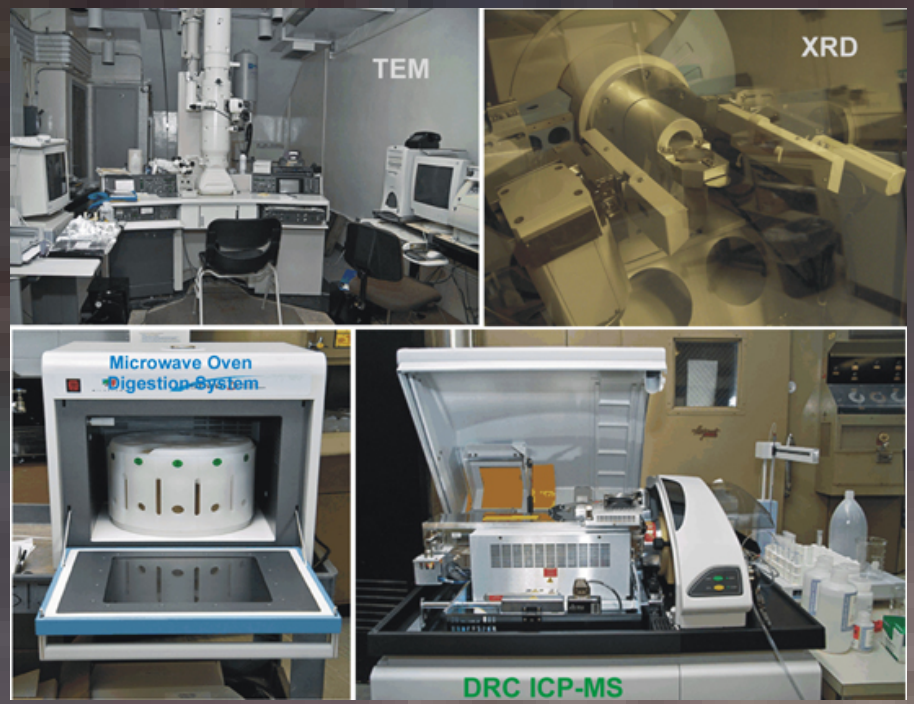
- Visually obvious problem
- Can make personal connections
- Clear health link

The Course Theme…
Air Quality in Brooklyn

- Sampling equipment is relatively inexpensive, easy to use, and portable

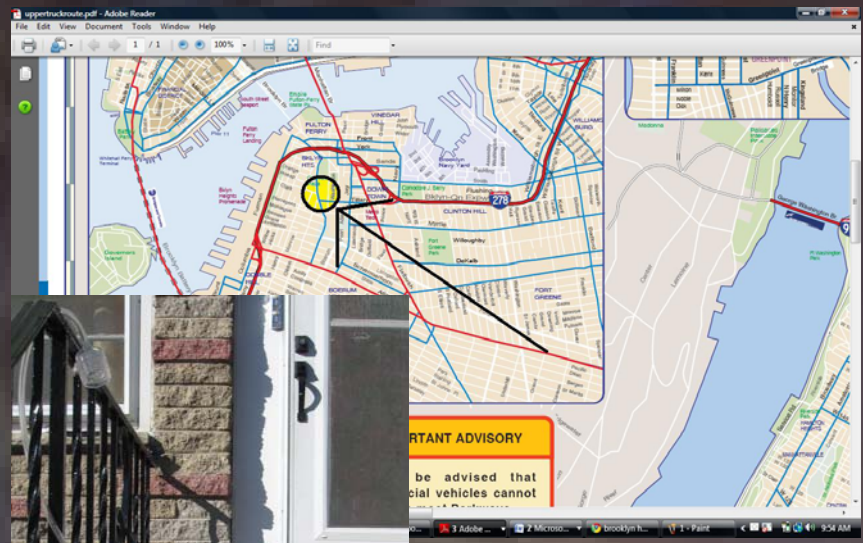
The Course Theme…
Air Quality in Brooklyn

- Can use available research equipment, and that is relatively easy to operate



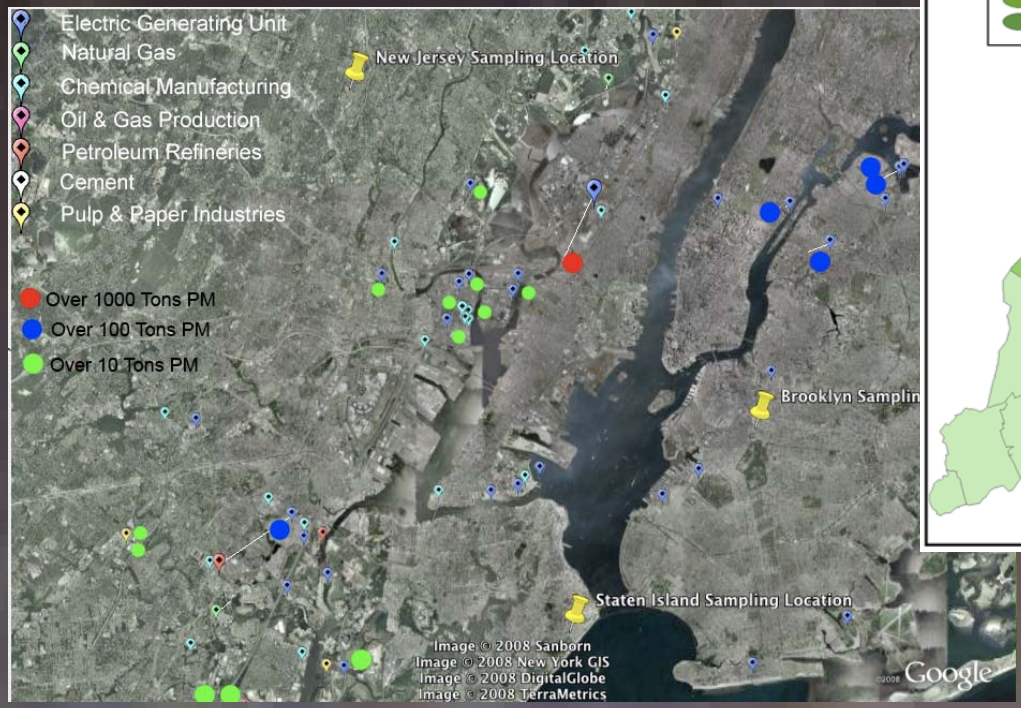
The Course Theme…
Air Quality in Brooklyn

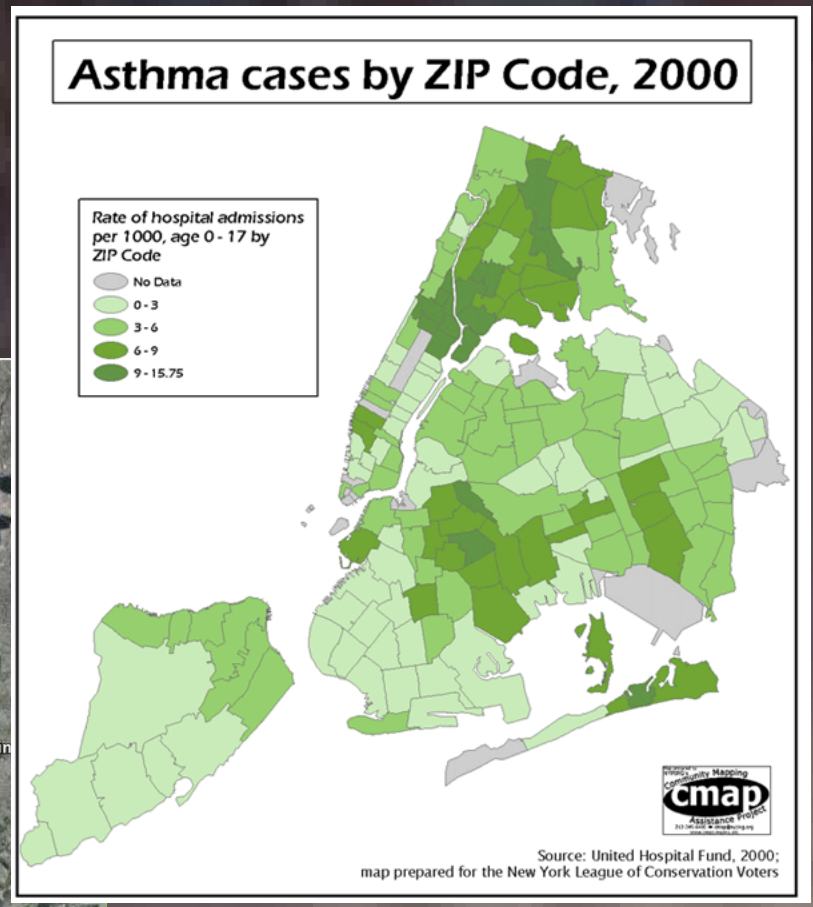
- Sampling sites can be selected by students, do not need to be monitored by faculty, and can be revisited if necessary
  - Logistics and transportation are simplified
  - Students can maximize personal connection
  - Control given to students



The Course Theme…
Air Quality in Brooklyn

- Geospatial analysis and datasets can be integrated easily



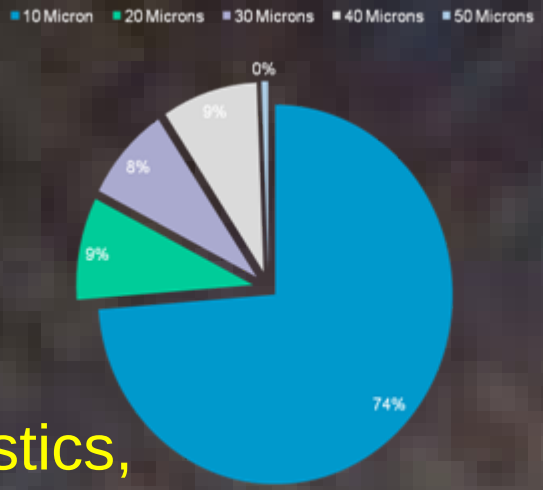


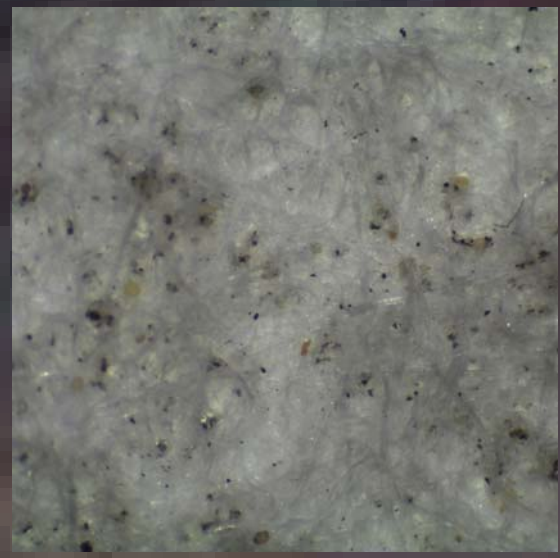
Student Projects in Fall 2009

- 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

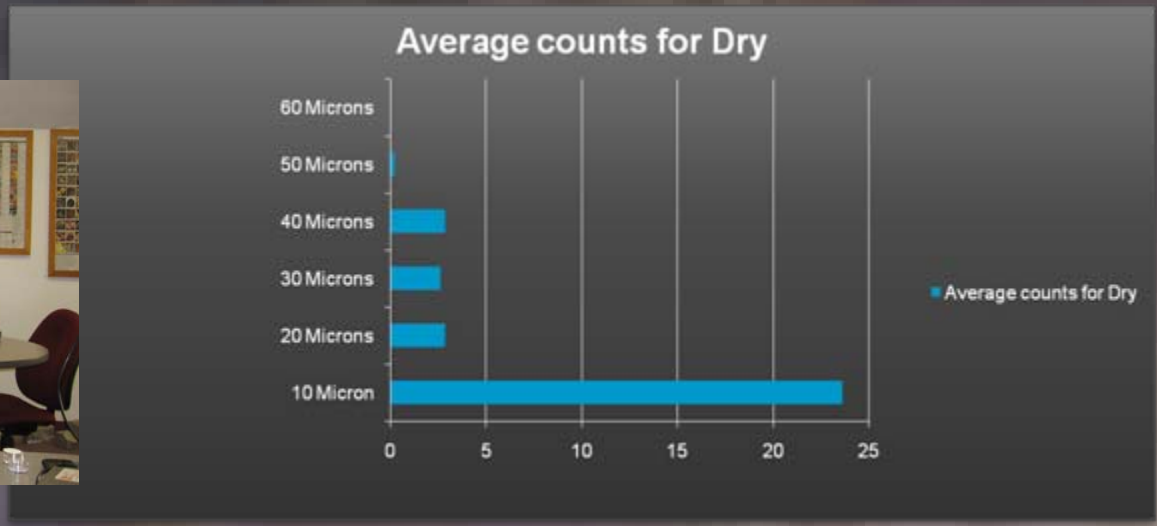
Types of Data Collected

- Particle sample characteristics
  - Abundance
  - Size Distribution





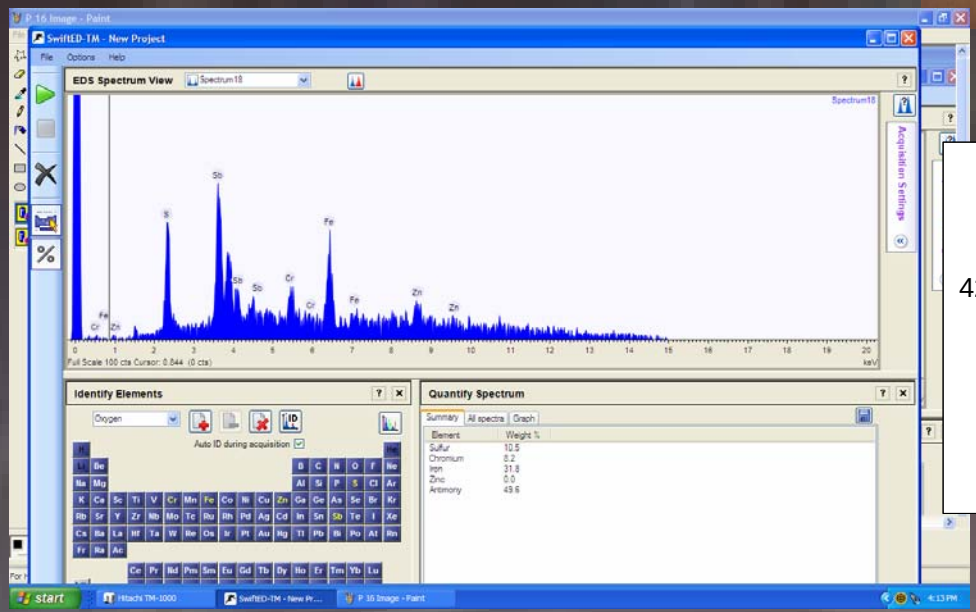
Excel, Basic Statistics, Graphing

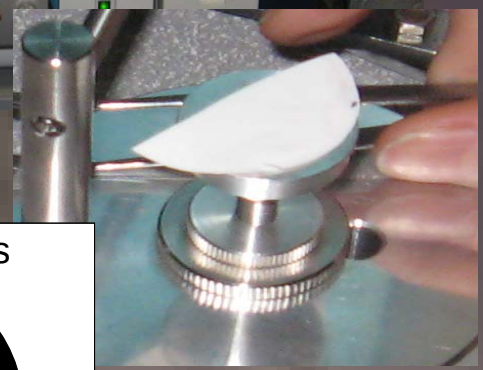


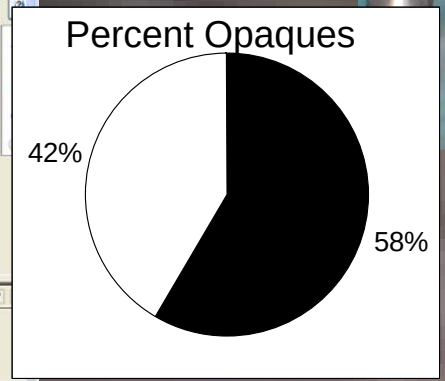
Types of Data Collected

- Particle Compositions
  - Optical Properties
  - Composition by EDS

Technology, Graphics, Mineral Compositions



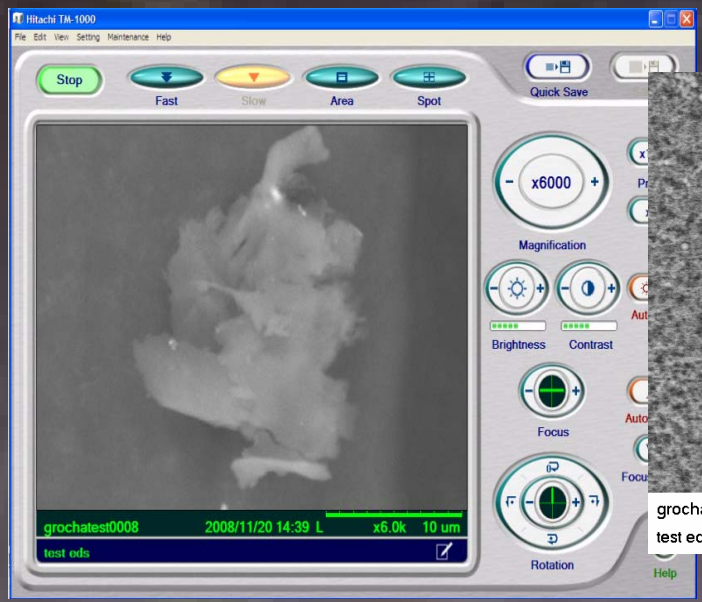


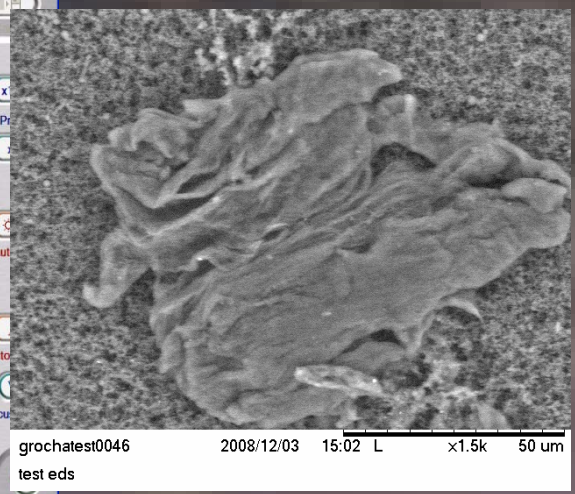


Types of Data Collected

- Particle Morphology
  - PLM and SEM

Technology, Graphics, Mineral Structures

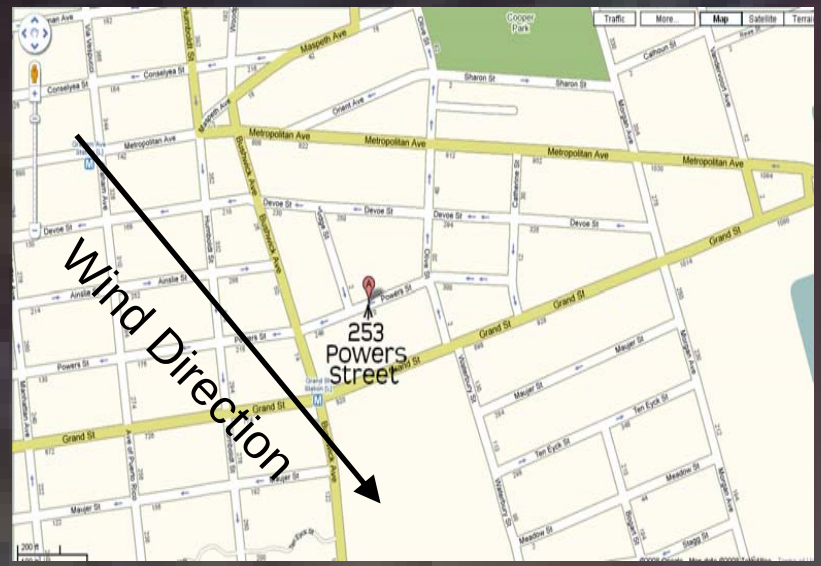


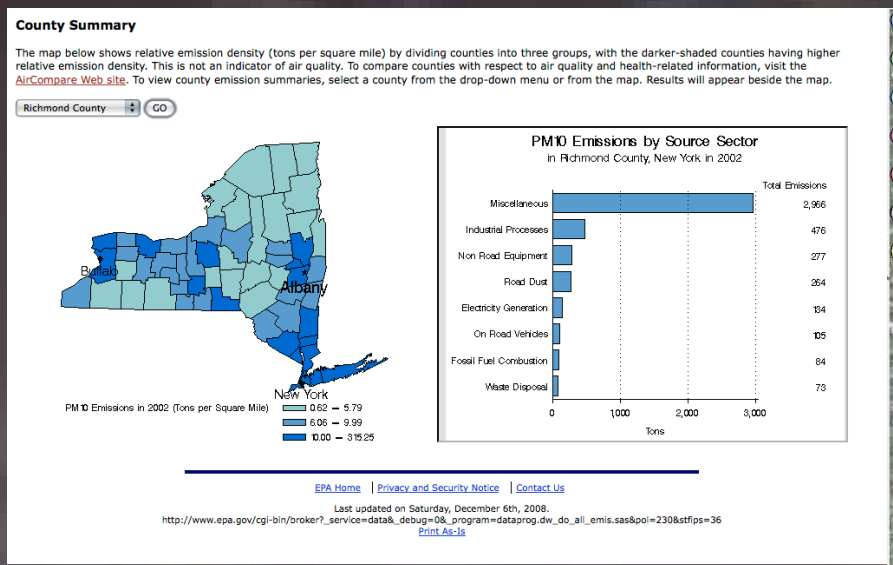


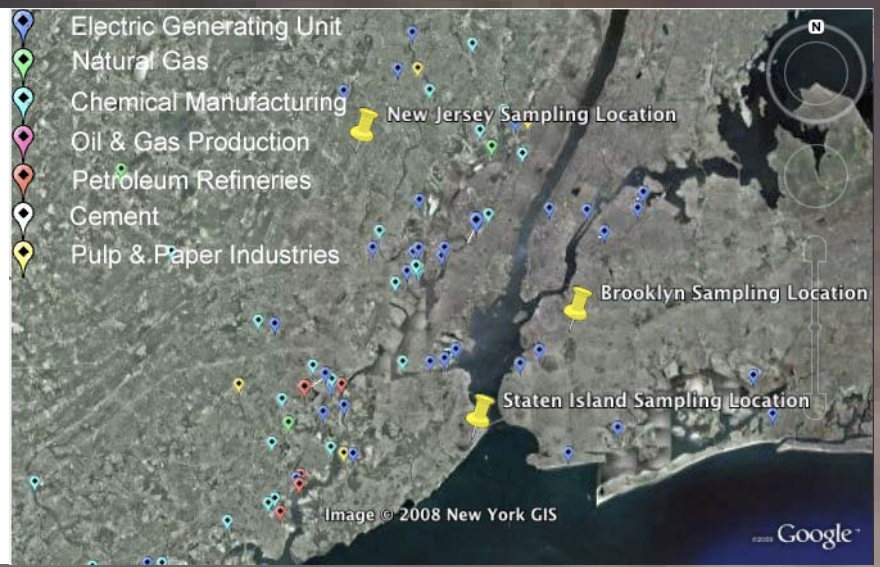
Types of Data Collected

- Geospatial Data
  - Sample and Source Locations
  - Wind Direction

GPS, GIS, Maps



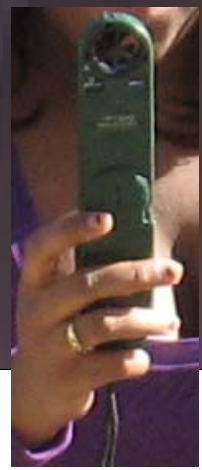


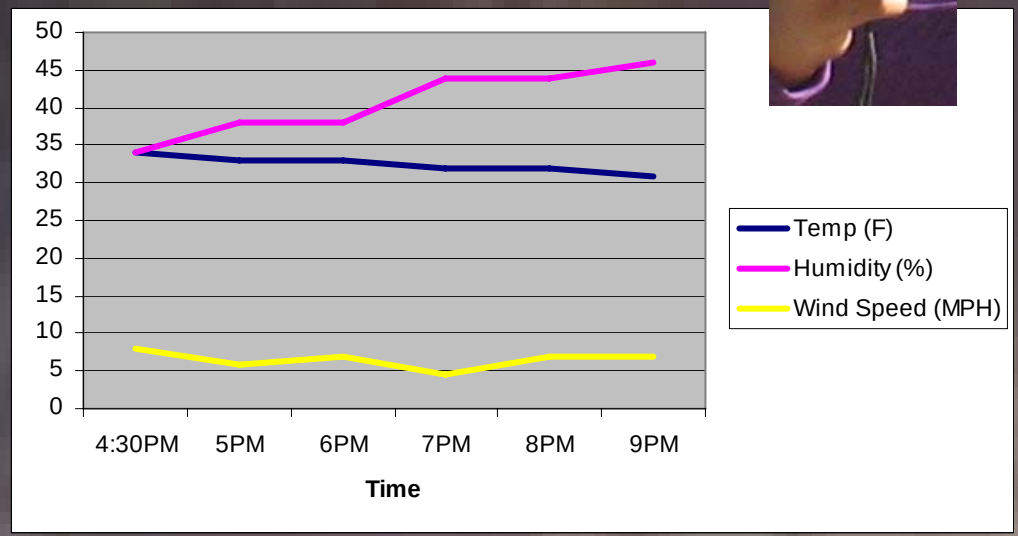


Types of Data Collected

- 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