Bringing Data & Research into the Classroom

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Our backgrounds

- **Josh**: Taught at Montclair State (public university in NJ) for 8 years
  - Interdisciplinary department that has undergrad through PhD students
  - Variety of courses from intro courses for non-majors up through graduate course
  - Specializes in hydrology and watersheds
  - Attempts to use data in about 1/3 of all class meetings

- **Jennifer**: Taught at Winona State Univ. (4-yr public university in MN) for 13 years
  - Primarily undergraduate institution
  - Intro/Gain Ed, upper-level majors, and science courses for future teachers
  - Specializes in planetary geology and geoscience education
  - Has used some data-rich activities but aspires to do more

- **Your** level of experience with data/research?

Why incorporate data/research into the classroom?

- Think of and then pair up and generate a quick list of the benefits

Why incorporate data/research into the classroom? (example responses)

- **Cognitive growth**
  - Gain in knowledge and critical thinking skills
  - Think and work like a scientist (if made explicit)
  - Communicate effectively
  - Think analytically and critically
  - Increase retention in the course and/or discipline

- **Personal growth**
  - Gain confidence
  - Feel more independent
  - Become more self-motivated

- **Professional growth**
  - Enhance interests in a science career
  - Develop ties to the scientific community

Objectives for this session

- Make the case for using data and conducting research in the classroom.
- Give examples at a variety of scales.
- Have you generate exercises that incorporate data/research into your teaching.

Various scales and outcomes of classroom activities

- **Data & Research**
  - Using data as a piece of the research process

- **Time involved**: 10 minutes, a class/lab, a semester?

- **Individual vs. group**

- **Outcome**: thinking (TPS), writing, presentation, homework...
Data example: Trends in Precipitation
Northern NJ Annual Precipitation (1885-2017)

Data example: Images
http://earthobservatory.nasa.gov/IOTD/view.php?id=86041

Data Example: Climate Classification

Research example
• Mapping Hurricane Sandy storm surge in GIS

Research Example
• Finding shocked quartz in new samples from an impact crater.

Tips and Recommendations for Data
• Set the tone early: begin on the first day of class
• Start with the basics: define axes, look at units, trends, etc.
• Be sure students are prepared to do what you’re asking them to do
• Ensure students see the relationship between the topic and course content.
• Incorporate group work.
• Make it clear how the use of data fits into the process of science.
• Use local examples.
Tips and Recommendations for Research

- Give detailed and clear directions at the beginning of the research experience.
- Frequent deadlines are necessary and important.
- Make clear the purpose of each component within the project and within the course.
- Build in time for flexibility.
- Give students freedom to choose a topic, with guidance.
- Ensure students see the relationship between the topic and course content.
- Peer review is helpful to provide formative feedback.
- Students should communicate results beyond the professor.
- Incorporate group work.
- Prepare students by using data in the classroom

Individual reflection

- Think of examples datasets to present in class
- Think of possible research projects to incorporate in a classroom
  - What level of class?
  - How long for discussion?
  - What will the students actually do? Will they write, do homework, share something

Additional Resources

- On the Cutting Edge Undergraduate Research as Teaching Practice (http://serc.carleton.edu/NAGTWorkshops/undergraduate_research/index.html)
- Council for Undergraduate Research (CUR); On the Cutting Edge Teaching with Data, Simulations, and Models (http://serc.carleton.edu/NAGTWorkshops/data_models/index.html)