AIM-UP!
Bringing big data to educators at small institutions

Kurt Galbreath
Northern Michigan University

Joseph Cook
Museum of Southwestern Biology
Student experiences in field work and specimen curation

Traditional Roles for Museums in Education
Traditional Roles for Museums in Education

Classroom/lab demonstrations and public exhibits
Traditional Roles for Museums in Education

Specimen-based student research experiences
What does collections-based teaching add to undergraduate education?

• Inspiration!

• Fundamental skills
  • Natural history
  • Manipulating data
  • Scientific process

• Integration...
  • across time and space
  • between biotic and abiotic
  • from genomes to organisms to ecosystems
Obstacles to collections-based teaching

Educators often...

- don’t understand how museums contribute to science and society
- don’t have access to robust natural history collections
- don’t know how to access museum data

Problems are especially acute at small institutions
E. g., Northern Michigan University
- ~7800 students; ~750 student biology majors
- Small collections with limited resources

Mammal collection currently has <500 specimens.
What can be accomplished with this?
Improvements to data accessibility offer potential to engage a broader audience...

E.g., **VeriNet**

- 17,727,066 records
- 276 collections
- 87 publishers
- user-friendly search and mapping tools

... but alone fall short of educational tools.
The challenge educators face:

Educational Goal

- What’s the question?
- What data do I need?
- Where do I get data from?
- How do I use the database?
- How do I manipulate the data so that they are useful to me?
- How do I analyze the data?
- How do I interpret the results?
- What concepts will not be taught to make time during the semester?
- Did I achieve the educational goal?
AIM-UP! NSF-funded RCN

Expanding beyond traditional museum experiences by...

- promoting museum literacy
- increasing accessibility of natural history collections to educators/public
- developing tools to facilitate database use by educators/students
- partnering with non-traditional museum users (e.g., Behavior, Geography, Art)

www.aim-up.org
AIM-UP! – the network


International: U Guelph, U Nacional de la Republica (Montevideo)

High Schools: Highland High (urban) and Sitka High (rural)

*original network participants
AIM-UP! – the network
Building the network – promoting dialogue around annual conceptual themes:

1) Integrative Inventories: Exploring Complex Biotic Associations Across Space and Time (MSB)
2) Making Sense of Geographic Variation (UAM)
3) Evolutionary Dynamics of Genomes (MCZ)
4) Biotic Response to Climate Change (MVZ)
5) Coevolving Communities and the Human Dimension (MSB)
AIM-UP! Educational Modules

- online resources to help educators use museum specimens and/or data to enhance their teaching
Modules leverage specimen data to teach a variety of concepts, including:

- Introduction to natural history collection data
- Introduction to GIS
- How to read a scientific paper
- Influence of climate change on plant morphology
- Introduction to phylogenetics
- Plant biogeography and ecology

Goal is to make the benefits of collections-based education universally available.
AIM-UP! Educational Collaborations

Bringing student artists into the museum to develop new ways to convey/teach biological concepts
E.g., evolution of phenotypic variation and historical biogeography of Abert's squirrels.
AIM-UP! Network Participants: providing models for place-based student learning

Specimen-based, place-based discovery...

...can lead to student-centered activities focused on...

...morphology,...

...genomic variation,...

...gene flow, ecological niche, biogeography, etc.
What does Big (collections) Data bring to small institutions (the front lines for undergraduate biology education)?

- Temporal data
- Morphology
- Spatial data
- Genetic data
- Species associations
- Climate data
The opportunity at small institutions:

To train the next generation of museum biologists...

...and ecologists, wildlife managers, teachers, conservation biologists, economists, doctors, neuroscientists, climate change scientists, veterinarians, chemists, business owners, etc...
Are you interested in helping to build a biologically-literate and museum-aware society?

New members of the AIM-UP! network are welcome and encouraged!

Contact Joseph Cook - cookjose@unm.edu
Museum of Southwestern Biology
University of New Mexico