



# Collecting Measures of Success: Metrics for Collections Symposium

34<sup>th</sup> Annual meeting of the Society for the Preservation  
of Natural History Collections, Chicago, IL

## *Measuring Success for Collections: Educational Products and Outcomes*

Anna K. Monfils, Central Michigan University

Molly Philips, iDigBio, University of Florida

Libby Ellwood, La Brea Tar Pits and Museum

Debra Linton, Central Michigan University

Lisa White, University of California Museum of Paleontology



# Education is a critical aspect of the national digitization effort

- CollectionsWeb RCN
- Network Integrated Biocollections Alliance (NIBA)
- Advancing the Integration of Museums into Undergraduate Education (AIM-UP!)
- NSF Advancing the Digitization of Biological Collections (ADBC)
- Integrated Digitized Biocollections (iDigBio)
- Biodiversity Collections Network RCN (BCoN)

HOW TO MAKE A SCIENTIST'S HEAD EXPLODE:

ANECDOTAL EVIDENCE  
ISN'T VALID.

YES IT IS! I ONCE  
USED AN ANECDOTE AS  
EVIDENCE, AND LATER  
IT TURNED OUT I  
WAS RIGHT!



# 2014 Survey of Students Working in Natural History Collections



# Students in NHC Collections: Outcomes

- Students working in collections are:
  - Performing high order curatorial tasks
  - Critical to curation and digitization
  - Expressing increased understanding of the nature of science
  - Indicating collections based experience is influencing their undergraduate experience, course/major selection and graduate school plans

# Students in NHC Collections: Opportunities

- Potential to optimize undergraduate experience by increasing:
  - Exposure to research
  - Interactions with internal/external researchers
  - Professional development opportunities
  - Training in all aspects of collection science

# 2015 ASSESSMENT OF COMMUNITY NEEDS AND EXISTING RESOURCES IN NATURAL HISTORY COLLECTIONS BASED SCIENCE EDUCATION



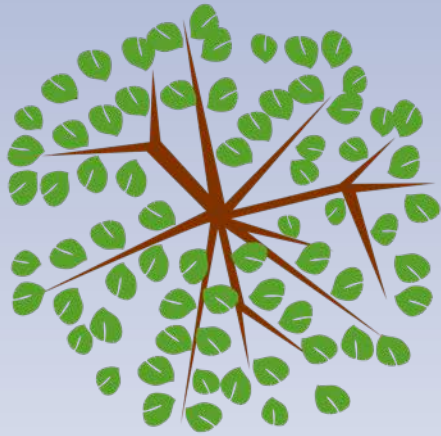
**BIODIVERSITY  
COLLECTIONS NETWORK**



# Community needs and existing resources in natural history collections based science education

- I. Integrate various efforts and centralize resources to efficiently use time and effort
- II. Incorporate biology educators
- III. Develop meaningful undergraduate research experiences incorporating specimen curation continuum and data lifecycle
- IV. Provide best practices for mentoring student workers in natural history collections
- V. Develop, assess, and refine educational modules involving natural history collection data
- VI. Disseminate/propagate materials
  - i. Introduce modules in educational venues (education conferences and journals)
  - ii. Incorporate partners
  - iii. Train the teachers
  - iv. Incorporate in textbooks and on-line resources





# BLUE

Biodiversity Literacy in Undergraduate Education

Biodiversityliteracy.org

[BLUE-L@LISTS.UFL.EDU](mailto:BLUE-L@LISTS.UFL.EDU)

@BiodiversityEd

<http://tinyurl.com/bluecontact>

# Goals of the BLUE Data Network

- Cultivate a diverse and inclusive network of biodiversity researchers, data scientists, and biology educators
- Build community consensus on core biodiversity data literacy competencies.
- Develop strategies and exemplar materials to guide the integration of biodiversity data literacy competencies into introductory undergraduate biology curricula.
- Extend the network to engage a broader community of undergraduate educators in biodiversity data literacy efforts.

# Defining Biodiversity Literacy and Core Competencies

## Digital Data in Biodiversity Research Conference

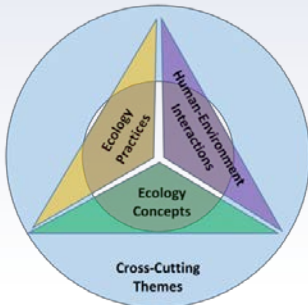


**BIO DIVERSITY NEXT**  
Better data - better science - better policies.

Building a global infrastructure for biodiversity data. Together.

22 - 25 October 2019  
Main Conference  
20 - 21 October 2019

4DEE



**N** ADVANCING THE INTRODUCTORY BIOLOGY EXPERIENCE

Home Why Intro Bio? Conference Information Conference Registration

Nebraska · Advancing the Introductory Biology Experience

### Advancing the Introductory Biology Experience

*A conference to develop a unified vision for undergraduate introductory biology*

Presented by the National Association of Biology Teachers  
August 7-9, 2019  
Howard Hughes Medical Institute, Chevy Chase, Maryland

# Creating Open Education Resources

The screenshot displays the 'Resources' section of the BLUE website. It features a grid of six resource cards, each with a title, author information, version, and metadata. The cards are:

- Movement: Nature's Flying Machines** by Blake Cahill, Anna Monfils, Debra Linton (Version: 1.0). Metadata: citizen science, quan... 16 likes, 16 views, 0 shares, 05.23.2019.
- Data is the New Science** by Anna Monfils, Debra Linton, Libby Ellwood, Molly Phillips (Version: 1.0). Metadata: data in the classroo... 110 likes, 27 views, 0 shares, 04.12.2019.
- Following the Data** by Anna Monfils, Debra Linton, Molly Phillips, Libby Ellwood (Version: 1.0). Metadata: data in the classroo... 80 likes, 9 views, 0 shares, 04.09.2019.
- Amphibian Diversity: Species Richness and Precipitation** by Debra Linton, Anna Monfils, Molly Phillips, Libby Ellwood (Version: 1.0). Metadata: data in the classroo... 84 likes, 18 views, 0 shares, 03.19.2019.
- Species Range Over Space and Time** by Debra Linton, Anna Monfils, Libby Ellwood, Molly Phillips (Version: 1.0). Metadata: data in the classroo... 49 likes, 12 views, 0 shares, 03.19.2019.
- Liberating Data for Biodiversity Research** by Libby Ellwood, Austin Mast (Version: 1.0). Metadata: Lab, Teaching materi... 49 likes, 19 views, 0 shares, 03.19.2019.

[https://qubeshub.org/community/groups/blue\\_data/blueresources](https://qubeshub.org/community/groups/blue_data/blueresources)



# BIO 620: Student Centered Curriculum Design for the 21<sup>st</sup> Century Biology Classroom



Fall 2018 BIO 212: Foundations of Form and Function

# Student and Instructor Resources

## Description

Movement is a key function required for the survival and reproduction of organisms. Microorganisms, such as bacteria and unicellular protists, achieve movement via cellular structures such as cilia and flagellae. Plants and fungi are incapable of individual locomotion but can disperse their offspring via seeds and spores and can grow towards or away from environmental stimuli. Animals have evolved a multitude of methods for movement in terrestrial, aquatic, and aerial environments. One of the most successful types of animal locomotion is **flight**. Flight has evolved at least four separate times, in the insects, pterosaurs, birds, and bats. Flying animals have a diversity of body forms and aerial abilities. They can teach us a lot about form and function. In fact, scientists study animal flight to develop flying robots, airplanes, and rocket ships. In today's lab, you will investigate the forces involved in the form and function of flight in birds and insects.

Students completing this module will be able to:

- Explain the forces acting on flight.
- Describe how lift is created by wings.
- Compare how antagonistic muscles (flexors, extensors) power flight in animals with endoskeletons and exoskeletons.
- Discuss how wing morphology (form) relates to flight ability (function).
- Evaluate the impact of body mass and wing morphology on bird migration distance.

Instructor Access

Download Materials

# Citation with DOI

## Cite this work

Researchers should cite this work as follows:

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Cahill, B., Monfils, A., Linton, D. (2019). **Movement: Nature's Flying Machines**. Biodiversity Literacy in Undergraduate Education, QUBES Educational Resources. doi:10.25334/Q4P165

[BibTex](#) | [EndNote](#)

# Data Usage

## BLUE Resources on QUBES

Project **manager**





☑ **Publications** » ☰ teaching material Movement: Nature's Flying Machines » Usage

📊 All usage »



### Movement: Nature's Flying Machines

published May 23, 2019 in Teaching Materials

		Current month May 2019	Previous month Apr 2019	Total to date* *since May 23, 2019
<b>Pageviews</b> 		50	0	50
<b>Accesses</b> 		20	0	20



# Facilitating Broad Scale Implementation

 <p>SPNHC 2019 May 25-31</p> 	 <p>Undergraduate Biology Education Research <i>Gordon Research Conference</i></p> <hr/> <p><b>Achieving Widespread Improvement in Undergraduate Education</b></p> <p>June 23 - 28, 2019</p> <p><a href="#">Apply Now</a></p>	
<p>5th Life Discovery – Doing Science Biology Education Conference</p>  <p><b>Microbiomes to Ecosystems: Evolution and Biodiversity Across Scale, Space and Time</b></p> <p>March 21-23, 2019 Gainesville, Florida</p>		

# *Vision and Change\**

## Strategies for Change Action Item

### *A Community of Practice*

“Faculty must engage in regular conversations and peer-to-peer mentoring about teaching and learning, and improve, test, and share their own understanding of how students learn. ”



Small Collection Symposium, Boise, ID 2014

# Connecting Students to Citizen Science and Curated Collections

STUDENTS CONTRIBUTING TO OUR UNDERSTANDING OF GLOBAL BIODIVERSITY

Course Documents

Instructor Login

## What?

Learn about plant systematics and collecting in the context of our information-rich digital age. Connect physical plant specimens to citizen science observations and online herbarium databases. Explore how making these connections helps contribute to our understanding of global biodiversity.



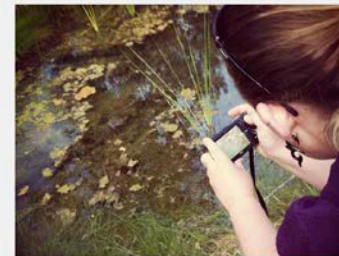
## Why?

This project will help prepare you to be an information-literate scientist, with an understanding of what biological collections data represent, where they come from, and how they can be used.



## How?

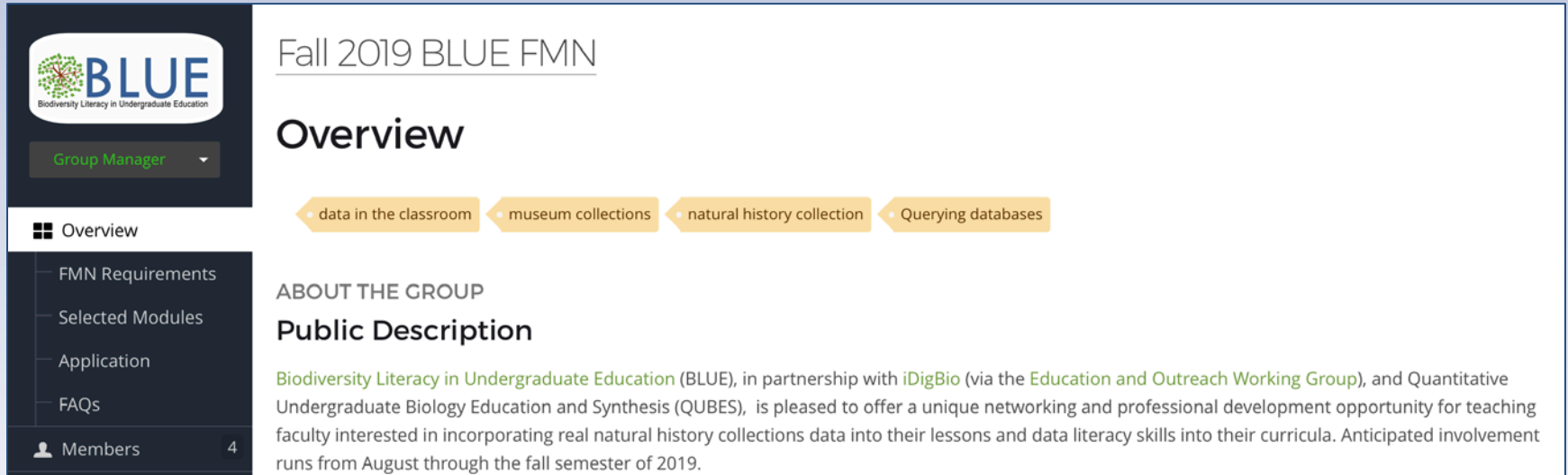
You will complete this project through a combination of traditional plant taxonomy instruction, participation in citizen science, and exposure to online databases.




The content on this website is the product of a collaborative effort initiated by the [North American Network of Small Herbaria](#) Interest Group. Contributing authors include Erica R. Krimmel (*UC Berkeley's Sagehen Creek Field Station*), Debra L. Linton (*Central Michigan University*), Travis D. Marsico (*Arkansas State University*), Anna K. Monfils (*Central Michigan University*), Ashley B. Morris (*Middle Tennessee State University*) and Brad R. Ruhfel (*University of Michigan*). © 2019

This page has been visited 44562 times.

# 2019 BLUE Faculty Mentoring Network and BLUE Scholars



 **BLUE**  
Biodiversity Literacy in Undergraduate Education

Group Manager ▾

- Overview
- FMN Requirements
- Selected Modules
- Application
- FAQs
- Members 4

## Fall 2019 BLUE FMN

### Overview

- data in the classroom
- museum collections
- natural history collection
- Querying databases

#### ABOUT THE GROUP

#### Public Description

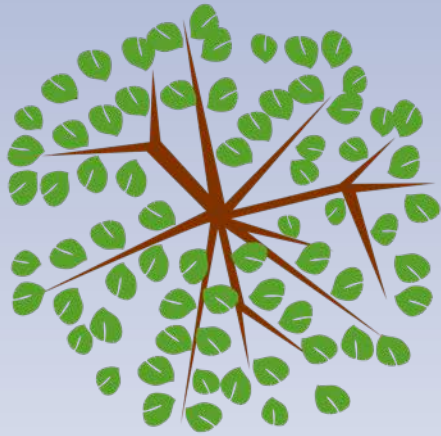
Biodiversity Literacy in Undergraduate Education (BLUE), in partnership with iDigBio (via the Education and Outreach Working Group), and Quantitative Undergraduate Biology Education and Synthesis (QUBES), is pleased to offer a unique networking and professional development opportunity for teaching faculty interested in incorporating real natural history collections data into their lessons and data literacy skills into their curricula. Anticipated involvement runs from August through the fall semester of 2019.

<https://qubeshub.org/community/groups/blue2019>

# Acknowledgements

- Biodiversity Literacy in Undergraduate Education (BLUE)
  - A. Monfils, D. Linton, E. Ellwood, M. Phillips & L. White (NSF 1730526).
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  - J. Cook, S. Edwards, S. Ickert-Bond, & E. Lacey (NSF 0956129 )
- iDigBio Education and Outreach Working Group, Small Collections Network, and WeDigBio
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- CollectionsWeb
  - L.A. Prather, H. Bart, M. Blackwell, & J. Woolley (NSF 0639214)
- Biodiversity Collections Network (BCoN)
  - R. Gropp & A. Bentley, (NSF 144178)
- Quantitative Undergraduate Biology Synthesis Community
  - Donovan, S., Eaton, C.D., Gower, S.T., Jenkins, K.P., LaMar, M.D., Poli, D., Sheehy, R. & Wojdak, J.M. (NSF 1446258)





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# Metrics

## How do you show your impact? Who is your audience?

- Learning outcomes through vetted surveys (evidence)
- Dollars affiliated with
- Undergraduate researchers and paid students
- Courses served (note disciplines)
- Demographics
- Number
- Student outcomes
- Jobs requiring skills that
- Affiliations (number of letters of support)
- Website hits
- Affiliated institutions/initiatives
- Records of mentions for Education and Outreach
- Training (Ecology Education Scholar/Blue Scholar)
- Letters from institutions
- Service to national initiatives
- Presentations (with student authors)
- Site your collection!!!!
- Publish your datasets
- Numbers all the time!!!!
- Engage Community of Practice (RCN-UBE)