



Supporting faculty in teaching and the interface of math x biology

Carrie Diaz Eaton
Unity College

Sam Donovan
University of Pittsburgh

M. Drew LaMar
The College of William and Mary

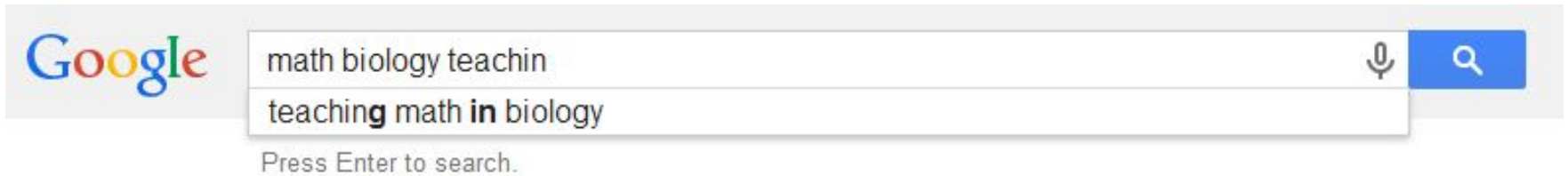
Kristin Jenkins
BioQUEST

Jeremy Wojdak
Radford University

Introductions

- I am a mathematician in a biology department
- Small liberal arts environmental college which emphasizes sustainability science with interdisciplinarity/transdisciplinarity at core
- Evolutionary community ecologist
- Transform math courses to regain relevance (technical math vs theoretical)
 - lonely and inefficient process
 - teaching shared at conference - resource limitations
 - best practices?

QUBES: Quantitative Undergraduate Biology Education and Synthesis



The **synthesis** problem: Entities from mathematics and biology are working **independently** to create curriculum, content, and **educational experiences**, at the interface of these two fields, with the intended audience both **mathematics and biology** students.

How do we bring it all together??

QUBES Hub - qubeshub.org



[HOME](#) [RESOURCES](#) [COMMUNITY](#) [ABOUT](#) [SUPPORT](#) [EXPLORE](#)



QUANTITATIVE
UNDERGRADUATE
BIOLOGY
EDUCATION AND
SYNTHESIS

*The Power of Biology × Math ×
Community*

[Learn more about QUBES...](#)



QUBES Consortium



**Alliance of societies, institutions,
programs with a common goal**

FEATURED IN COMMUNITY



*Count the Ways:
Engaging Students in
Quantitative Biology
Education*

June 13-20, 2015
Harvey Mudd College



FEATURED IN RESOURCES



NEWS AND EVENTS

FEB 22, 2015

[NSF funding opportunity: BIGDATA program](#)

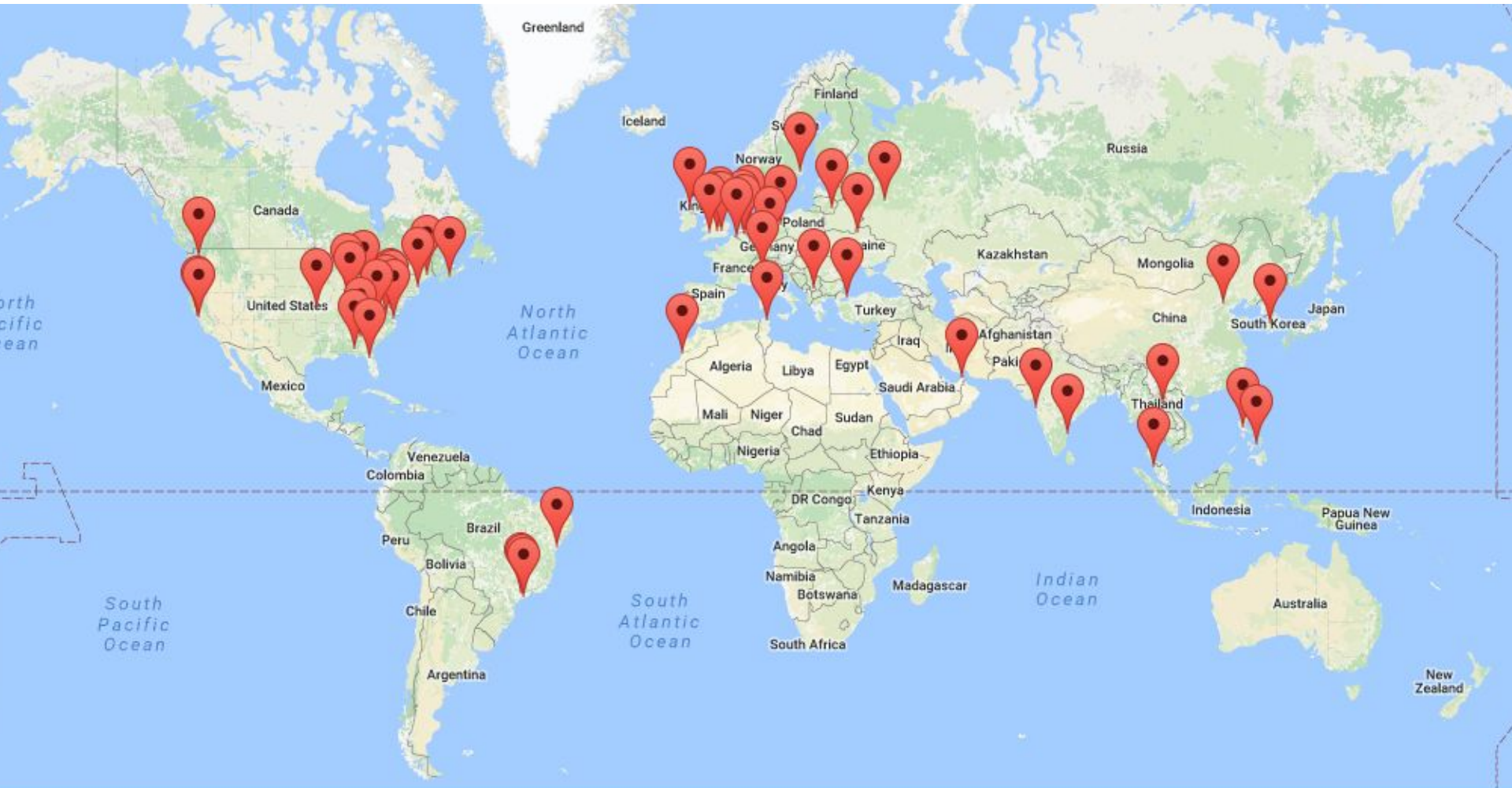
MAR 30, 2015

[SABER 2015 Abstract Deadline](#)

Vision for QUBES Virtual Center

1. Foster collaboration beyond silos (disciplinary language, place)

Community without borders?

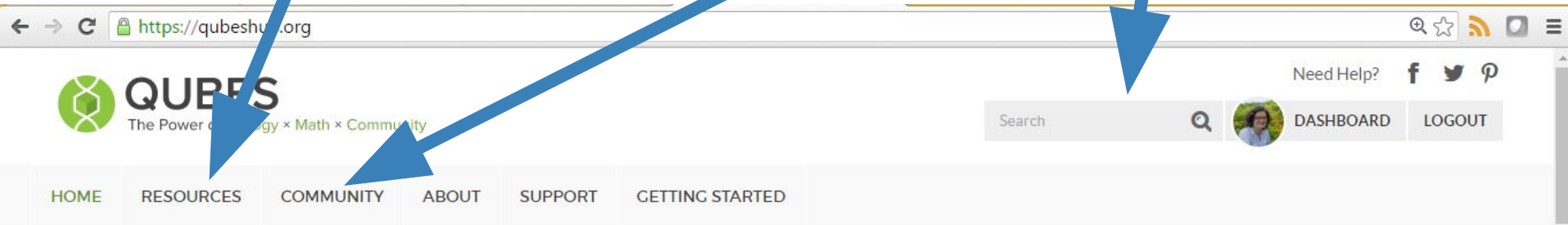


Navigation

Simulators, resources,
collections

Groups

Search here for
anything



QUBES can:

*...help build a user community
around your existing project.*

Learn more about partner projects...



**PROJECT
PARTNERSHIPS**

Groups for Meetings and Workshops

Making Meaning through Modeling: Problem solving in Biology

OVERVIEW



Group Member

Overview

General Information

Application

Travel and Housing

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Announcements

Blog

Collections 2

Forum




July 23-28, 2017

Michigan State University, East Lansing



We all use models in the classroom - visual, physical, mathematical, and symbolic representations abound in the curriculum. But are we making the best use of them as teaching tools? Scientists use models to explore new ideas, delve more deeply into complex phenomena, predict outcomes, explain events, structures and processes, and push past boundaries into the unknown (Odenbaugh, 2005). In a similar manner, students actively engaging with models use scientific concepts to explore complex systems and develop valuable skills in critical thinking, collaboration and communication. Models are an important component of science, however all models are only representations of reality. Effective and appropriate use of a model requires acknowledgement of the model's assumptions and limitations.

Open Community Groups

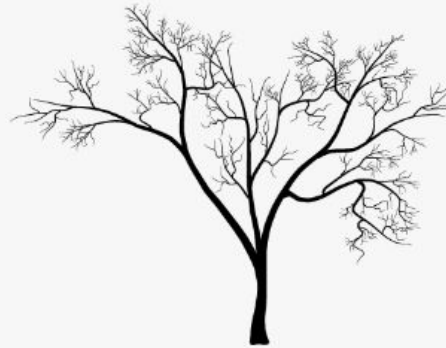


Group Manager ▾

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- Joining & Useful Features
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- Collections 16
- Courses
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- Projects
- Resources
- Files
- Activity

OVERVIEW

calculus



Calculus for the Life Sciences

Welcome to the Calculus for the Life Sciences Group. We are a community of educators dedicated to sharing resources for teaching calculus in the classroom. Our goal is to connect, share, and discuss various resources and teaching approaches to calculus for students in the life sciences.

Browse our resources or get involved and join our page!

All the resources here are available for anyone to browse through. If you want to add to this site, [join](#) our group and contribute!

Come see our Collections

Browse resources or contribute your own

Our [Collections](#) page displays all our user generated links of resources that

[Resources](#) in this group are works that have been submitted by our members.

Research Groups



Group Manager ▾

Overview

Oct 2015 Meeting

Schedule

March 2016 Meeting

March Schedule

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Calendar

NIMBioS Working Group: Unpacking the Black Box

OVERVIEW

ABOUT THE GROUP



Meeting Times and Places

Google Hangout

PRIMUS Meeting Times

- Tuesday, April 12, 11 am EDT
- Tuesday, April 26, 12:30 pm EDT
- Tuesday, May 10, 12:30 pm EDT

Framework Meeting Times

Bi-weekly, starting Thursday, April 7, 12:30 pm EDT

Calendar

Subscribe to PRIMUS calendar (.ics)

Subscribe to Framework calendar (.ics)



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The Power of Biology × Math × Community

YOUR IDEAS



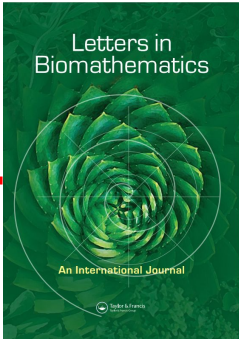
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TIEE



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NSDL
THE NATIONAL SCIENCE DIGITAL LIBRARY



SERC

ben
BIOSCIEDNET

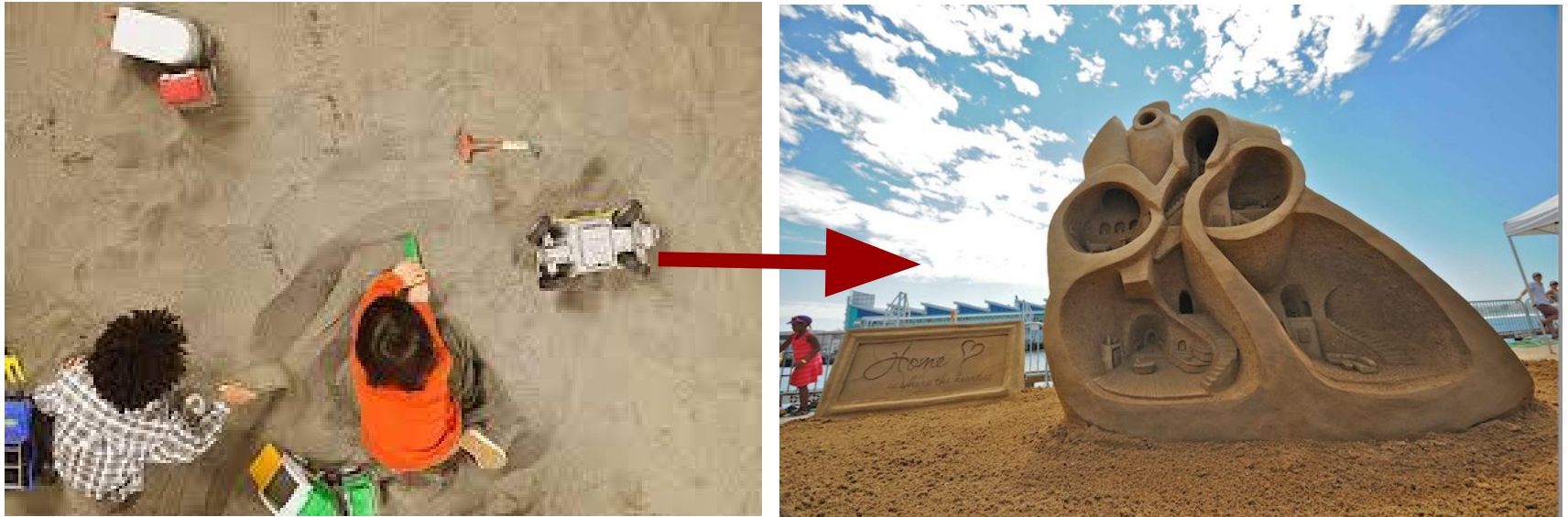
NSF NATIONAL CENTER FOR
CASE STUDY TEACHING IN SCIENCE

DRYAD

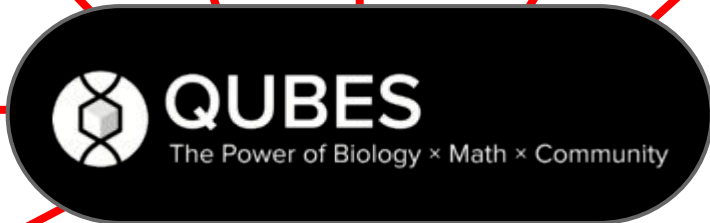
MERLOT II

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From Idea to Product



Virtual collaboration space



YOUR IDEAS

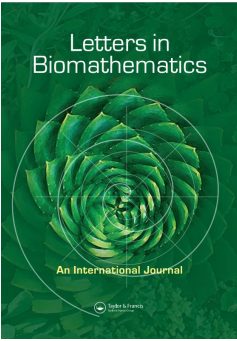


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MERLOT II

Vision for QUBES Virtual Center

1. Foster collaboration beyond silos (interdisciplinary language, place)
2. An easily searchable hub/repository for multiple types of quality curriculum/research objects

Qubeshub.org Simulation Tools

Resources: Software

Featured Software

R-Studio IDE for R



RStudio is a GUI for R, the statistical programming language.

[Launch RStudio](#)

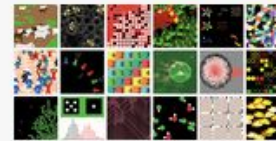
[RStudio page](#)

Links of interest:



[Using R in the Classroom](#)

NetLogo



NetLogo is a multi-agent programmable modeling environment. It is used by tens of thousands of students, teachers and researchers worldwide.

[Launch NetLogo](#)

[NetLogo page](#)

Links of interest:



[Using NetLogo in the Classroom](#)

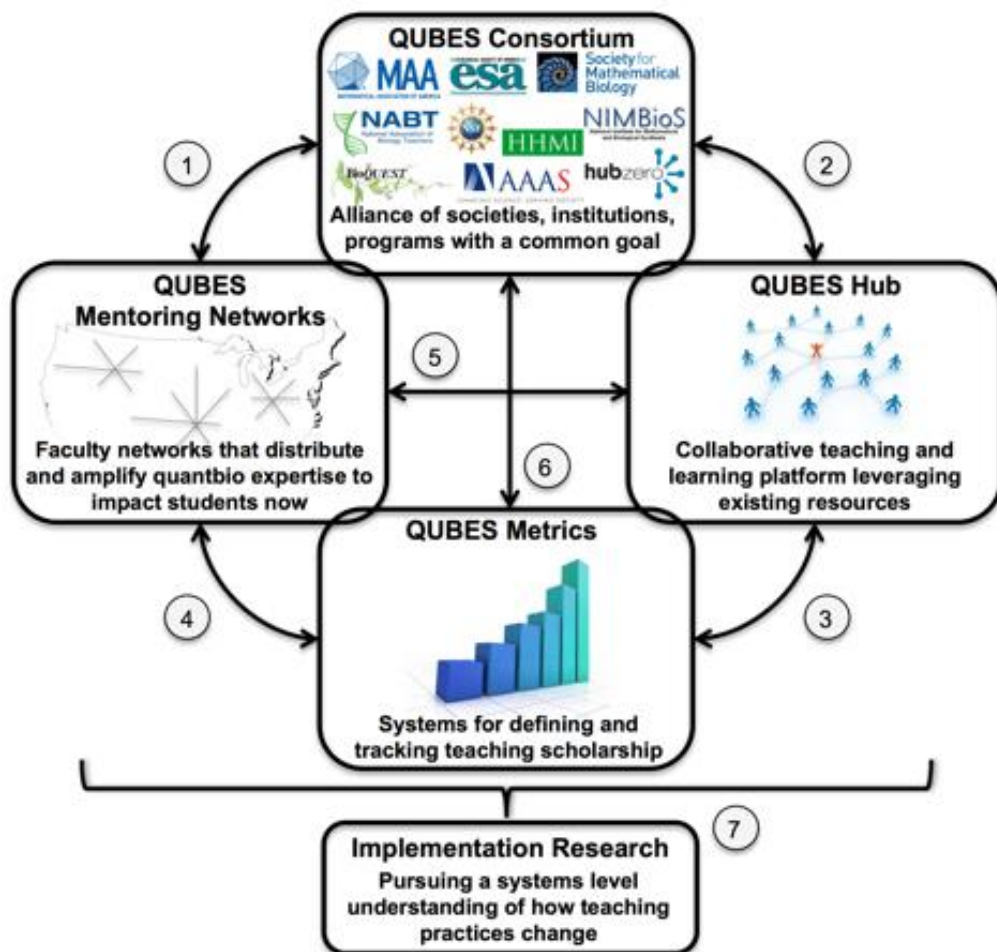
QUBES - Evolving community of resources and users

- YOU are QUBES.
- User contributed
 - If it isn't there - contribute it!
 - Make your work more visible
 - Presented something in the education sessions?
 - People are asking where to find it?
 - Want to know how people are using it later?
 - Share a favorite resource
- Resources evolve in community

Vision for QUBES Virtual Center

1. Foster collaboration beyond silos (language!)
2. A searchable hub/repository for multiple types of quality curriculum/research objects
3. Support faculty through implementation

Adopting, adapting, assessing



- Distributing Faculty Expertise
- Mentoring programs
- Community curriculum development and assessment
- PIs
 - Sam Donovan
 - Jeremy Wojdak
 - Kristin Jenkins

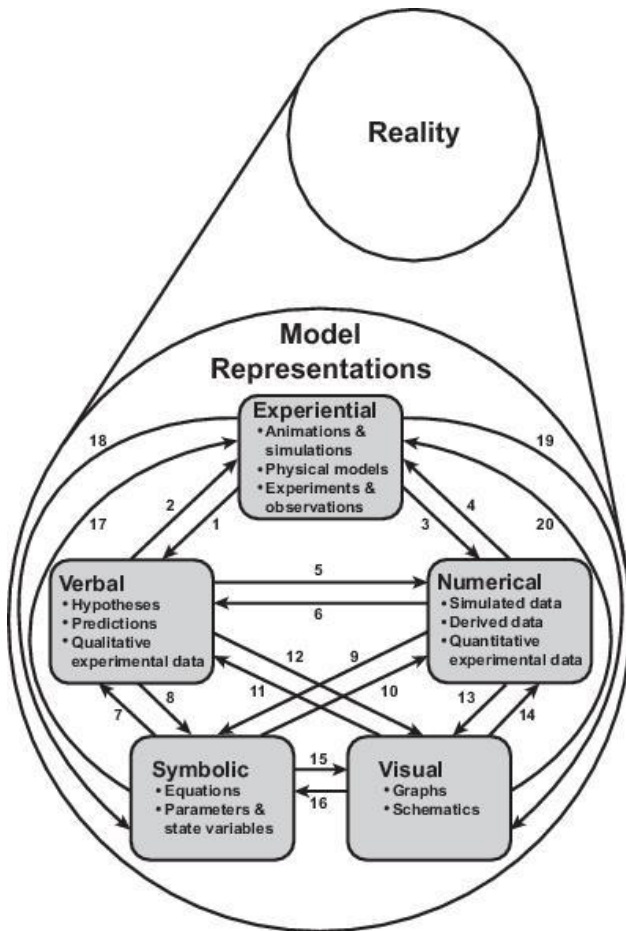
Vision for QUBES Virtual Center

1. Foster collaboration beyond silos (language!)
2. A searchable hub/repository for multiple types of quality curriculum/research objects
3. Support faculty through implementation
4. **Research-informed teaching**

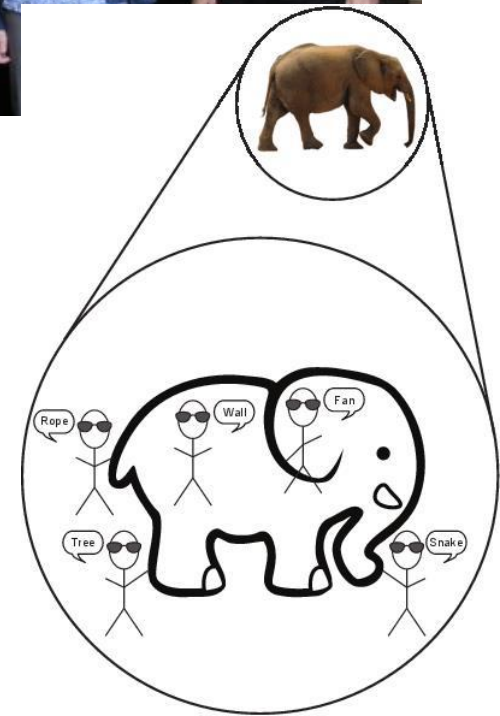
Research-informed teaching

- Not just curriculum
- Collected and synthesized research-based practices teaching mathematics for biological applications and biology audiences
- Example:
 - FMNs with research-derived data sets
 - Faculty mentoring networks implementation research
 - BioMAAP, attitudes and anxieties
 - NIMBioS Working group on modeling
 - Biocalculus, SUMMIT-P, teaching with data

NIMBioS Working Group - teaching modeling to biology students

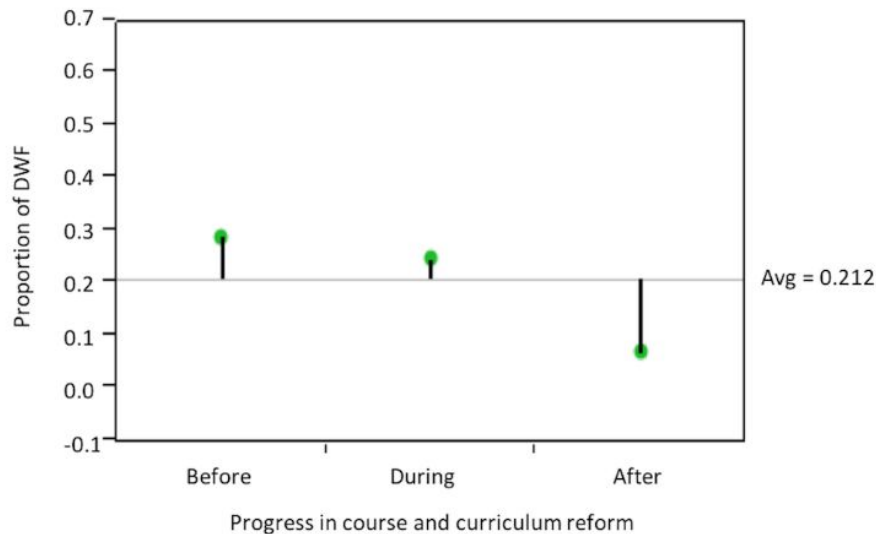


Interdisciplinary -
 math, math ed,
 physics ed,
 biology, science
 ed, bio ed

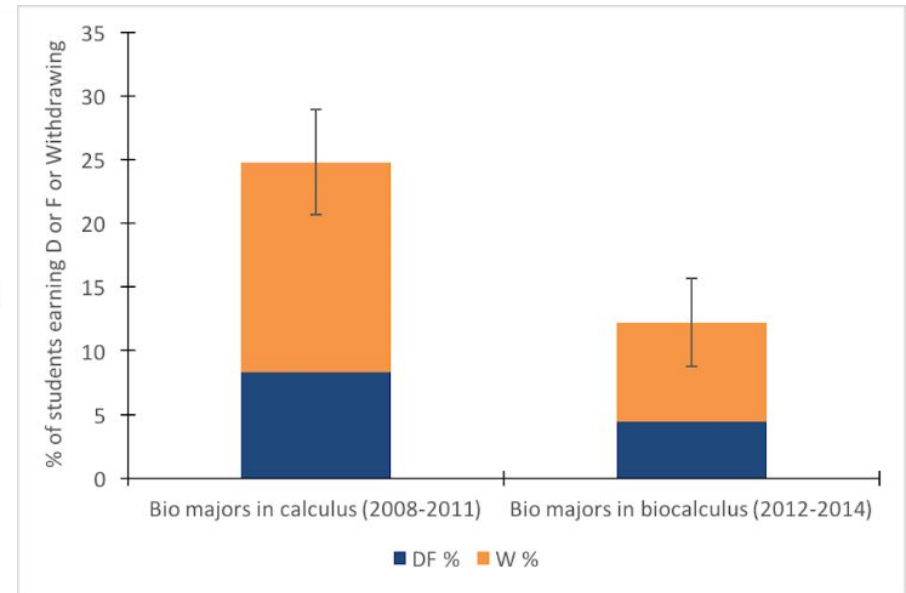


Education research projects (Bio)Calculus

- Retooling Calculus I/II for the needs of wildlife, ecology, and environmental science
- Joint work with Dr. Hannah (Callender) Highlander, University of Portland.



$\alpha = 0.05$



QUBES Supports You

adopt around **biology** broadly **build** career change
collaboration **community** confidence curriculum defined
develop education facilitate **faculty** implement
including information interface letters literacy
mathematics mentoring methods motivate multiple
options organizations particular pedagogical populations professional promote
public **quantitative** questions reach research rising
share skills storm **support** synergy training underserved
understanding uses vision

Join our community

- Get on QUBESHUB.ORG
 - Google single sign-on
 - If you have a project, let us know if you need help developing a group
- Supplement (NISER) to evaluate the site and make improvements so that it is easier to:
 - Find out what others are doing
 - Find what you are looking for (resources, curriculum, etc.)
 - Facilitate conversation
 - Use wishlist to request features!!!

Thank you!!

Additional Acknowledgements

- <<Advisory Board
- Current postdocs:
Arietta Fleming-Davies,
Gaby Hamerlinck
- Staff: Hayley Orndorf
and Jenny Kwan
- Past postdocs:
Alison Hale
- Past involved PIs:
Tom Gower, NCSU,
Anil Shende and DB
Poli, Roanoke
College, Bob
Sheehy, Radford
University, Jennifer
Cartier, Unity
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