QUBES

and the
Grand Opening of QUBESHub.org

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Unity College

Sam Donovan
University of Pittsburgh

Stith T. Gower
North Carolina State University

Kristin Jenkins
BioQUEST

M. Drew LaMar
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DorothyBelle Poli
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Radford University

Jeremy Wojdak
Radford University

Arietta Fleming-Davies
Radford University

Alison Hale
University of Pittsburgh

Gaby Hamerlinck
BioQUEST

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Math and biology education

Mathematical biology
Quantitative biology
Quantitative skills for biologists
Quantitative literacy for biologists

Biology
Life science
Environmental and biological sciences

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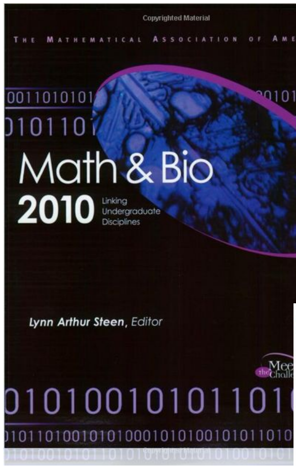
Math and biology education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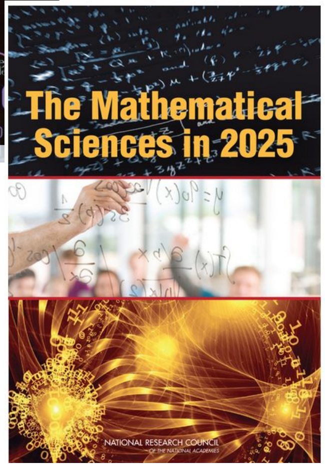
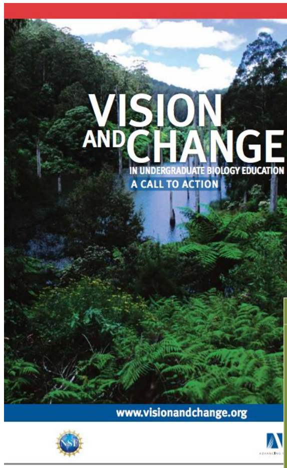
The Mathematical Association of America
Math & Bio
2010
Linking Undergraduate Disciplines
Lynn Arthur Steen, Editor

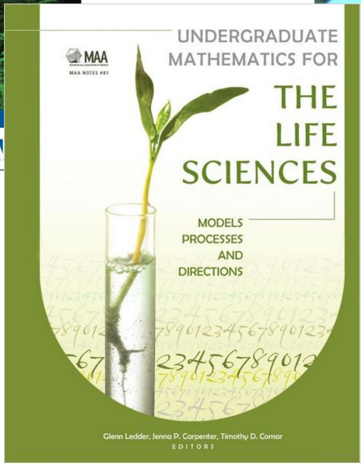
MAA


The Mathematical Sciences in 2025
NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

NAP



AAAS


MAA
MAA NOTES #81
UNDERGRADUATE MATHEMATICS FOR
THE LIFE SCIENCES
MODELS
PROCESSES
AND
DIRECTIONS
Glenn Ledder, Jenna P. Carpenter, Timothy D. Comar
EDITORS

MAA

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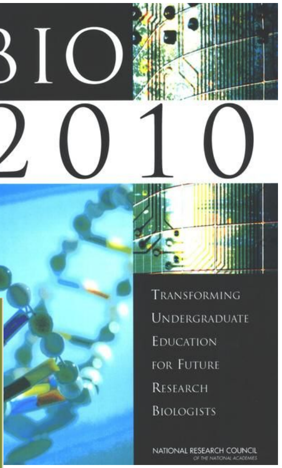


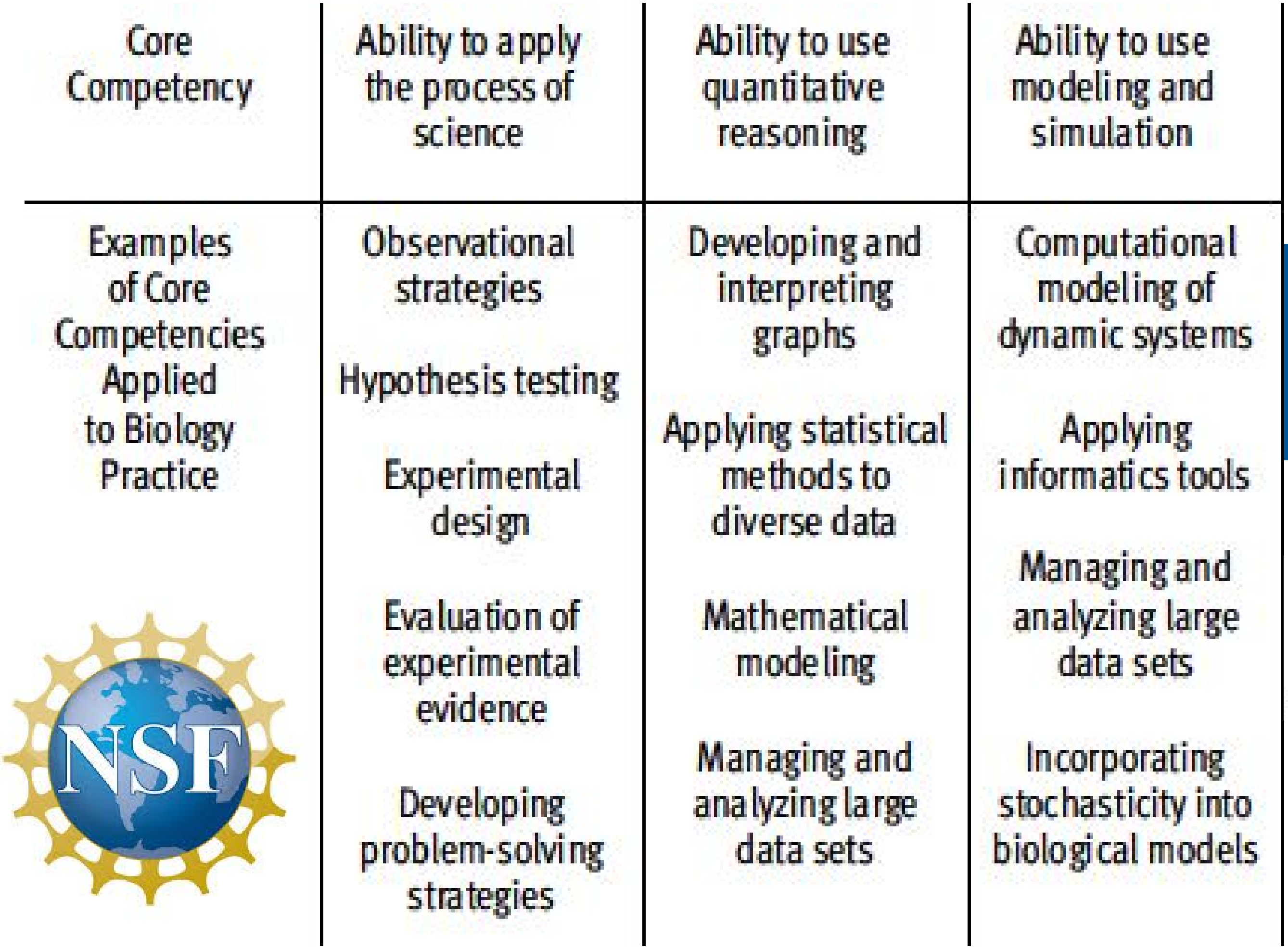
NRC

Changing math expectations…

COMMON CORE
STATE STANDARDS INITIATIVE
PREPARING AMERICA'S STUDENTS FOR COLLEGE & CAREER

- Decide if a specified model is consistent with results from a given data-generating process using simulation.

Changing biology expectations...



Core Competency	Ability to apply the process of science	Ability to use quantitative reasoning	Ability to use modeling and simulation
Examples of Core Competencies Applied to Biology Practice	Observational strategies Hypothesis testing Experimental design Evaluation of experimental evidence Developing problem-solving strategies	Developing and interpreting graphs Applying statistical methods to diverse data Mathematical modeling Managing and analyzing large data sets	Computational modeling of dynamic systems Applying informatics tools Managing and analyzing large data sets Incorporating stochasticity into biological models

NSF

VISION AND CHANGE
IN UNDERGRADUATE BIOLOGY EDUCATION

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Why do math + biology?

- To meet 21st century biology needs - theory (*e.g.* Servedio, 2014), understanding computational tools (*e.g.* bioinformatics), big data
- To meet student needs - life science students perform better in biomath courses
- PCAST report - if mathematicians don't do math for bio right, let the biologists do it
- Biology programs are reducing math requirements

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Working together might look like...

- Aligning content of prerequisite or corequisite courses to companion courses
- Changing biology program requirements
- Designing special life science-focused math and statistics courses
- Integrating biology-oriented examples or projects into math courses
- Emphasizing quantitative skills in biology courses
- Interdisciplinary student research opportunities

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QUBES Inspiration

- May 2013 – SUMS4Bio at Radford University
    - Jeremy Wojdak, Bob Sheehy and others

Workshop to tackle the big issues in math bio ed

- what are the issues moving integration forward?
- what are the solutions?

QUBES Inspiration

Have you ever...

- Been hired to create a math bio curriculum with no ed experience?
- Had no idea where to start developing an new math bio course?
- Created all your own materials from scratch?

Back then (or now), what would have helped you?

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How do we connect mathematics and biology that are currently working independently to create curriculum?

Quantitative
Undergraduate
Biology
Education and
Synthesis

How do we link research and pedagogy in math-biology?

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QUBES Activities

- May 2013 – SUMS4Bio at Radford University
- Jan 2014 – BioSIGMAA and NSF RCN Incubator Grant
- Mar 2014 – Development team meeting at Roanoke College
- May 2014 – Summit at NIMBioS at UT Knoxville
- Sept 2014 -- $2.9 million, 5 year NSF award
- Since Jan 2015 – QUBESHub site online (Beta)
- Feb 2015 – Summit at NESCent
- June 2015 – Development team meeting at Roanoke College
- October 2015 – Official QUBESHub site launch

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The process of reform

- Difficulties implementing existing classroom resources
  - Awareness
  - Adopting
  - Adapting
  - Implementing
  - Assessing

Traditional “faculty development workshops”

The hard part…

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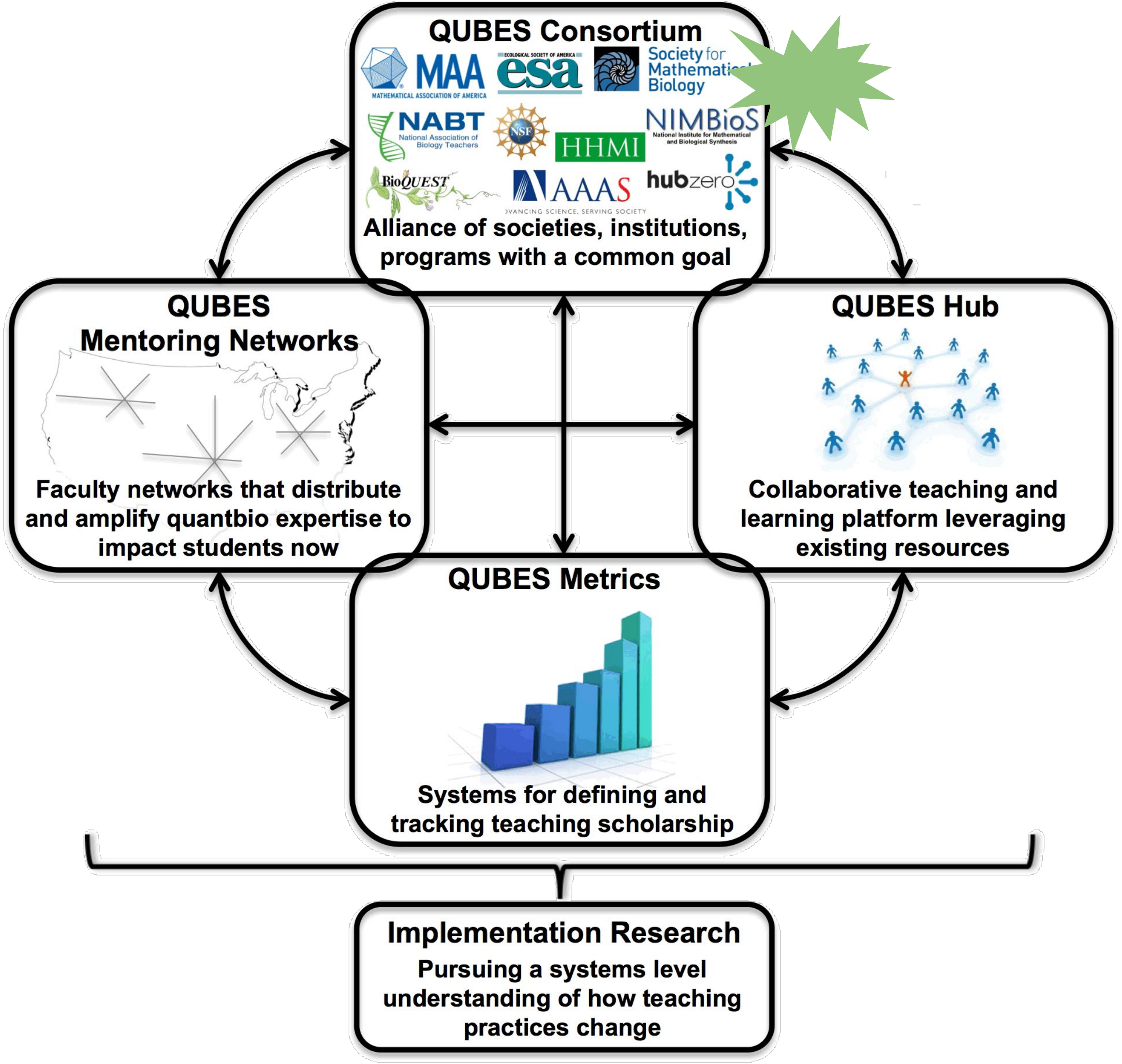
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QUBES Consortium

Alliance of societies, institutions, programs with a common goal

QUBES Mentoring Networks

Faculty networks that distribute and amplify quantbio expertise to impact students now

QUBES Hub

Collaborative teaching and learning platform leveraging existing resources

QUBES Metrics

Systems for defining and tracking teaching scholarship

Implementation Research

Pursuing a systems level understanding of how teaching practices change

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BIO SIGMAA

MAA
MATHEMATICAL ASSOCIATION OF AMERICA

ASM cue.org

BOTANICAL SOCIETY OF AMERICA

DRYAD

NIMBioS
National Institute for Mathematical and Biological Synthesis

GSA
Genetics Society of America

hhmi

ECOLOGICAL SOCIETY OF AMERICA
esa

BioQUEST
CURRICULUM CONSORTIUM

NABT
National Association of Biology Teachers

ascb
the american society for cell biology

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Consortium vision for QUBES

- Build community
- Use the synergy of multiple organizations to reach goals
- Facilitate collaboration and communication
- Promote the use of mathematics in understanding biology
- Use the questions of biology to motivate new mathematics
- Share information about uses of quant bio to the public
- Develop, share, adopt, and implement effective pedagogical methods and curriculum in quant bio
- Build faculty confidence with training, mentoring, and support

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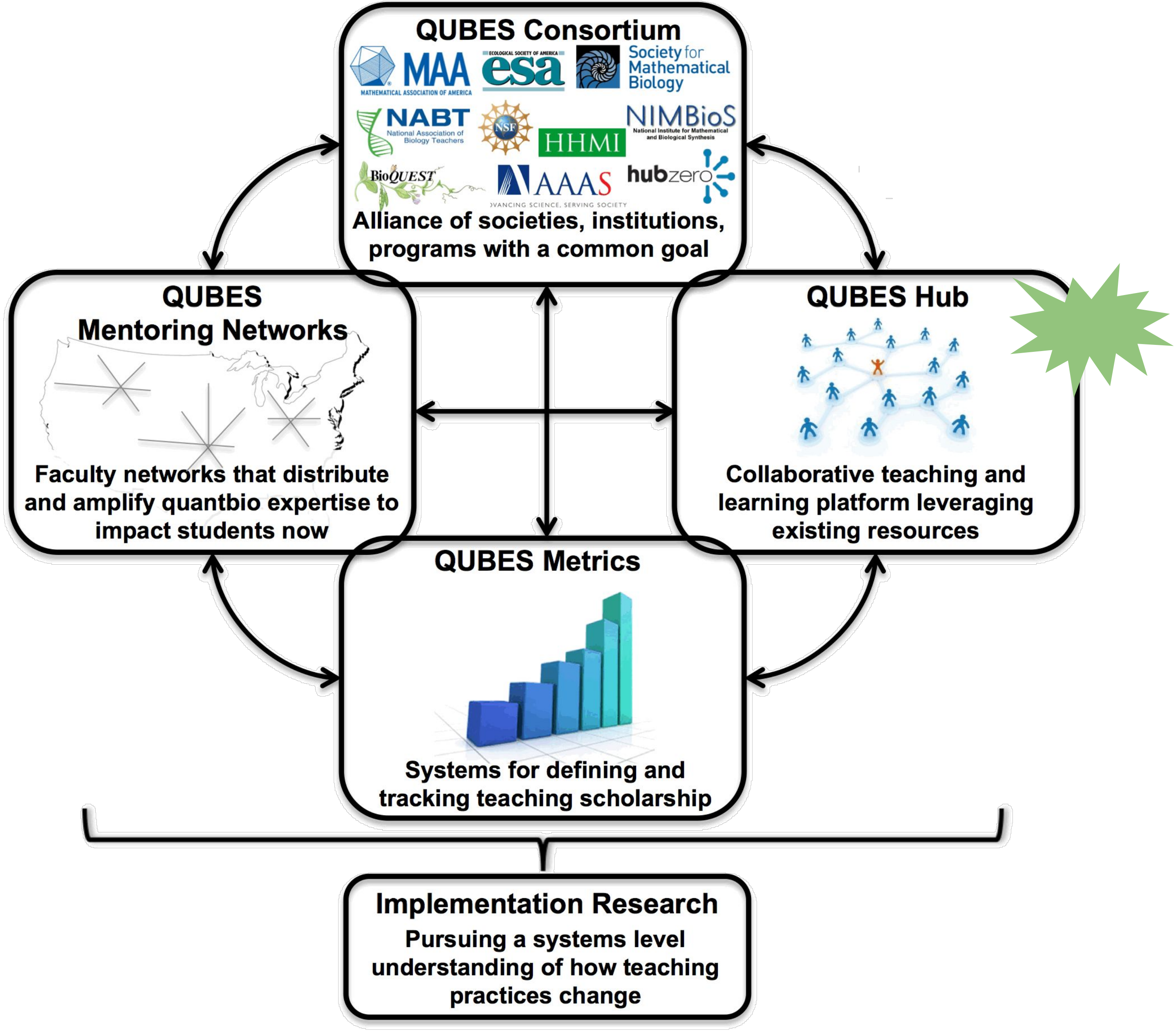
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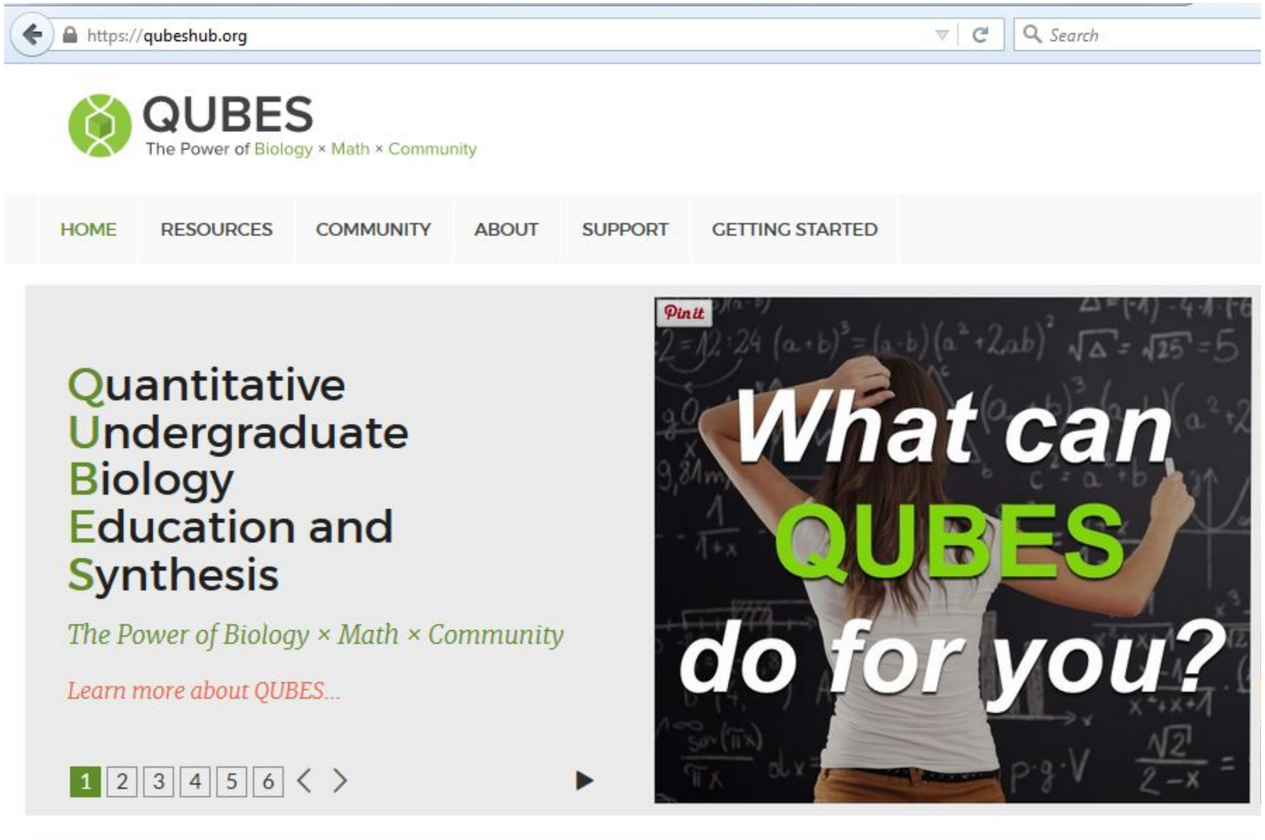
QUBES Hub (qubeshub.org)

Virtual space bringing the educational and research communities together



Quantitative
Undergraduate
Biology
Education and
Synthesis

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Learn more about QUBES...

What can QUBES do for you?

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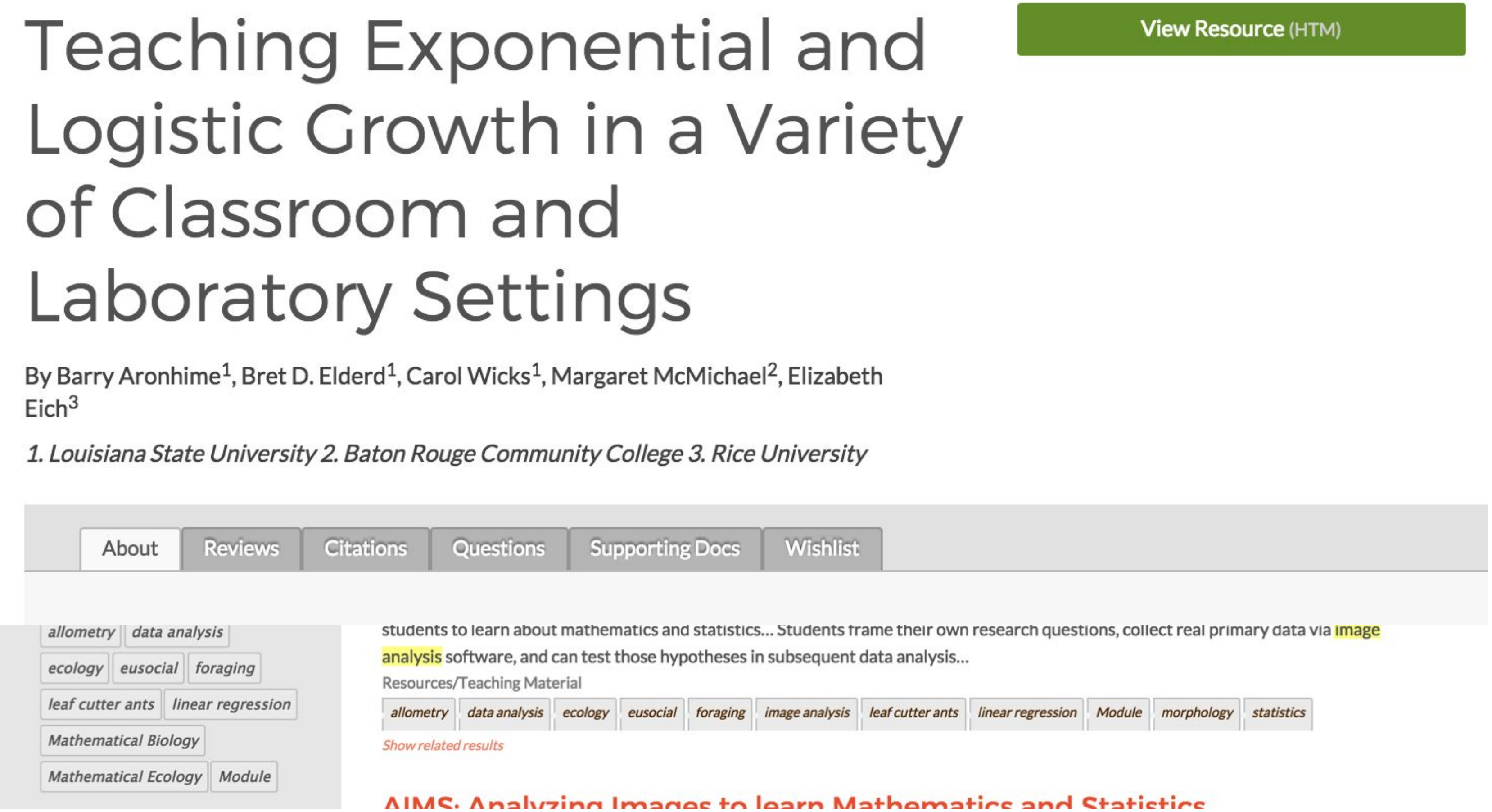
The Awareness Problem: Find/create/contribute high quality resources

Resources that are connected to "use scenarios", teacher talk, reviews, and ratings



Teaching Exponential and Logistic Growth in a Variety of Classroom and Laboratory Settings

By Barry Aronhime[1], Bret D. Elderd[1], Carol Wicks[1], Margaret McMichael[2], Elizabeth Eich[3]

1. Louisiana State University 2. Baton Rouge Community College 3. Rice University

allometry *data analysis* *ecology* *eusocial* *foraging* *leaf cutter ants* *linear regression* *Mathematical Biology* *Mathematical Ecology* *Module*

students to learn about mathematics and statistics... Students frame their own research questions, collect real primary data via image analysis software, and can test those hypotheses in subsequent data analysis...

Resources/Teaching Material

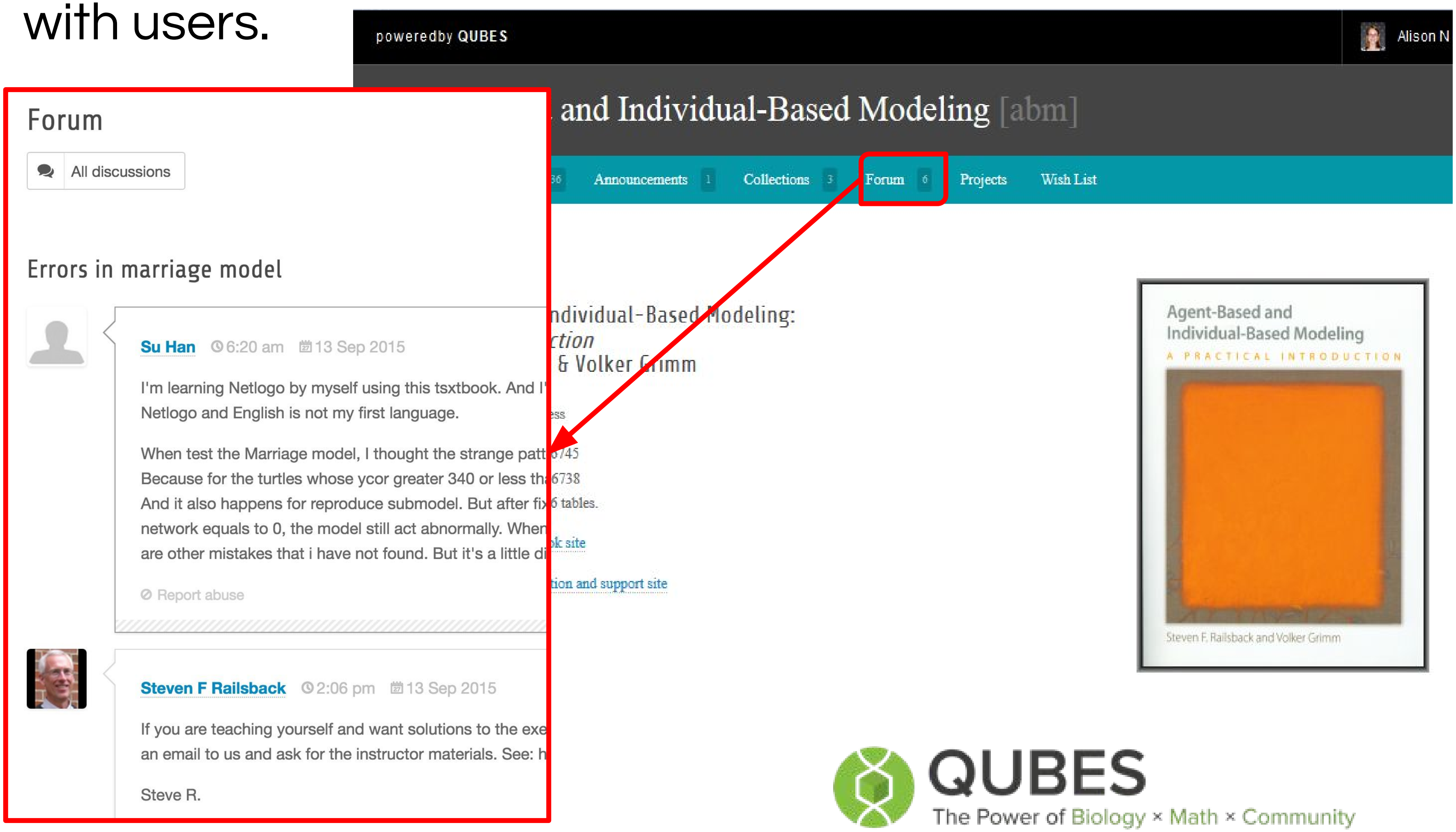
allometry *data analysis* *ecology* *eusocial* *foraging* *image analysis* *leaf cutter ants* *linear regression* *Module* *morphology* *statistics*

Show related results

AIMS: Analyzing Images to learn Mathematics and Statistics

The Awareness Problem: Build community around your project

Establish a branded space, share information and collaborate with users.



Errors in marriage model

Su Han 6:20 am 13 Sep 2015

I'm learning Netlogo by myself using this tsxtbook. And I' Netlogo and English is not my first language.

When test the Marriage model, I thought the strange patt Because for the turtles whose ycor greater 340 or less th And it also happens for reproduce submodel. But after fix network equals to 0, the model still act abnormally. When are other mistakes that i have not found. But it's a little di

Steven F Railsback 2:06 pm 13 Sep 2015

If you are teaching yourself and want solutions to the exe an email to us and ask for the instructor materials. See: h

Steve R.

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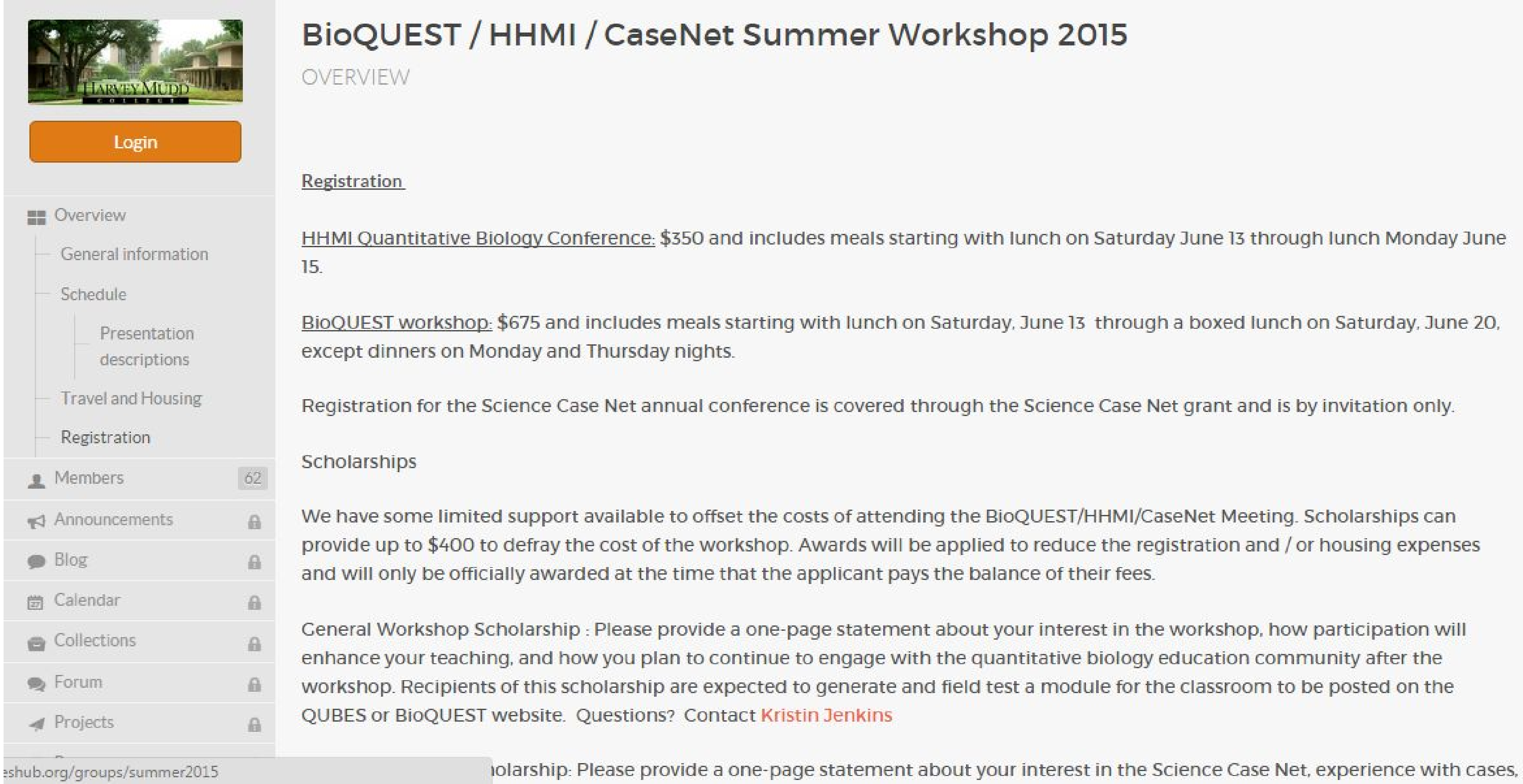
Providing a community of support: For Meetings and Workshops

Archive presentations and materials, keep the energy going between meetings.



BioQUEST / HHMI / CaseNet Summer Workshop 2015

OVERVIEW

Registration

HHMI Quantitative Biology Conference: $350 and includes meals starting with lunch on Saturday June 13 through lunch Monday June 15.

BioQUEST workshop: $675 and includes meals starting with lunch on Saturday, June 13 through a boxed lunch on Saturday, June 20, except dinners on Monday and Thursday nights.

Registration for the Science Case Net annual conference is covered through the Science Case Net grant and is by invitation only.

Scholarships

We have some limited support available to offset the costs of attending the BioQUEST/HHMI/CaseNet Meeting. Scholarships can provide up to $400 to defray the cost of the workshop. Awards will be applied to reduce the registration and / or housing expenses and will only be officially awarded at the time that the applicant pays the balance of their fees.

General Workshop Scholarship : Please provide a one-page statement about your interest in the workshop, how participation will enhance your teaching, and how you plan to continue to engage with the quantitative biology education community after the workshop. Recipients of this scholarship are expected to generate and field test a module for the classroom to be posted on the QUBES or BioQUEST website. Questions? Contact Kristin Jenkins

olarship: Please provide a one-page statement about your interest in the Science Case Net, experience with cases,

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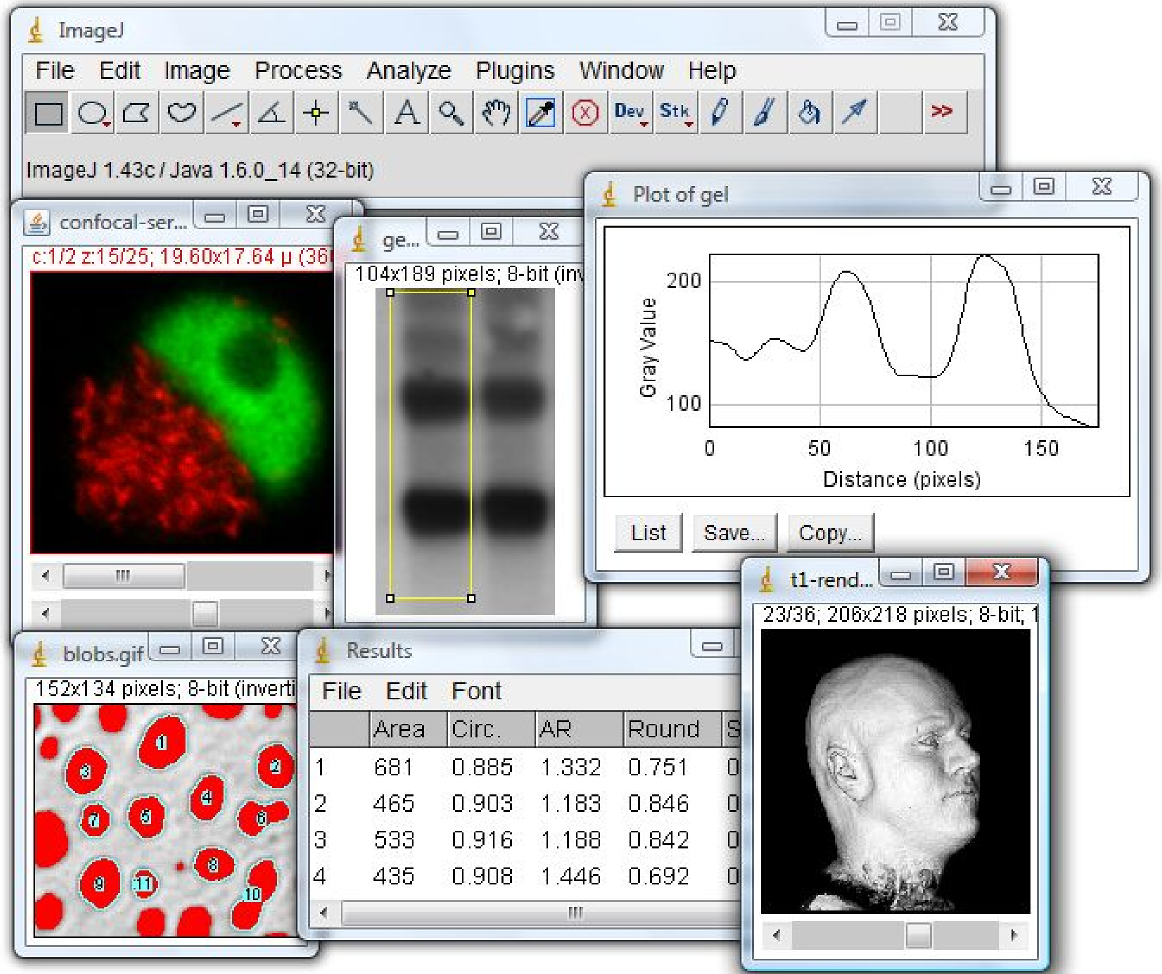
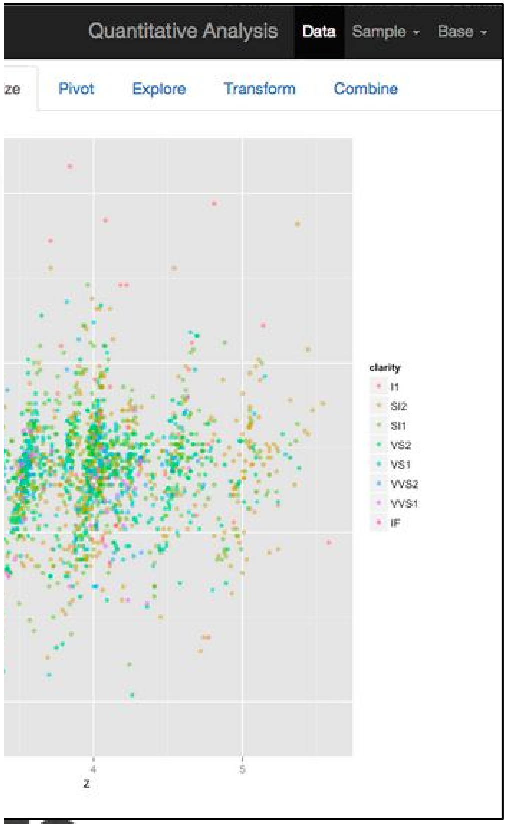
Removing barriers to adoption and use: Running computational tools

No local software installation required, instructors can get students interacting with data and models more quickly and in user-friendly environments

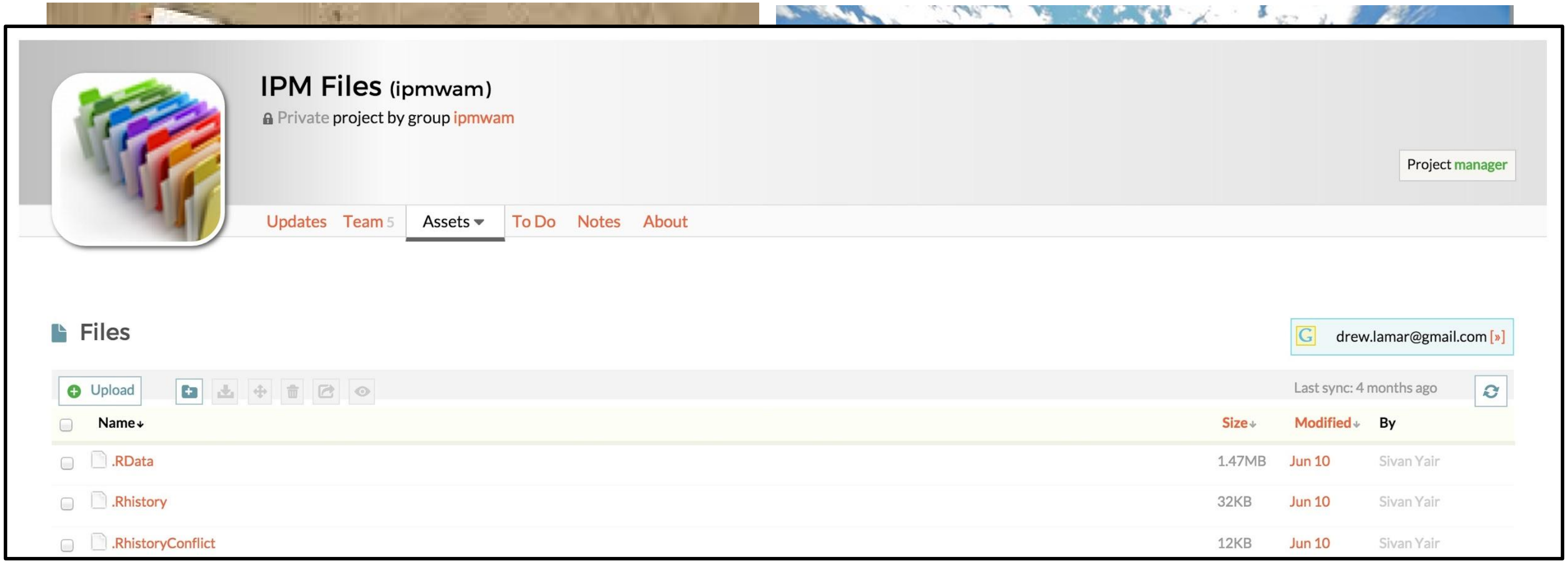


	Area	Circ.	AR	Round	S
1	681	0.885	1.332	0.751	0
2	465	0.903	1.183	0.846	0
3	533	0.916	1.188	0.842	0
4	435	0.908	1.446	0.692	0



ES
iology × Math × Community

Support from the idea to the product



IPM Files (ipmwam)

Private project by group ipmwam

Project manager

Updates Team 5 Assets To Do Notes About

Files

drew.lamar@gmail.com [»]

Upload

Last sync: 4 months ago

☐	Name	Size	Modified	By
☐	.RData	1.47MB	Jun 10	Sivan Yair
☐	.Rhistory	32KB	Jun 10	Sivan Yair
☐	.RhistoryConflict	12KB	Jun 10	Sivan Yair

Collaboration space

http://www.webmd.com/parenting/d2n-stopping-germs-12/slideshow-kids-germs-handwashing
http://sf.funcheap.com/event-series/carve-san-francisco-sandcastle-building-contest/

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Vision for QUBES Hub

1. Collaboration spaces: Combining features of many web/cloud services (WordPress, Google Drive, AWS, etc.)
2. Open Education Resources (OER): GitHub-style repository with versioning and forking, leading to live, adaptable, and ever-changing resources
3. Cloud computing: Bring *into your classroom* many software packages that have been prohibitive to use due to installation barriers
4. Communities *working together* on the quantitative arm of vision and change in undergraduate biology education

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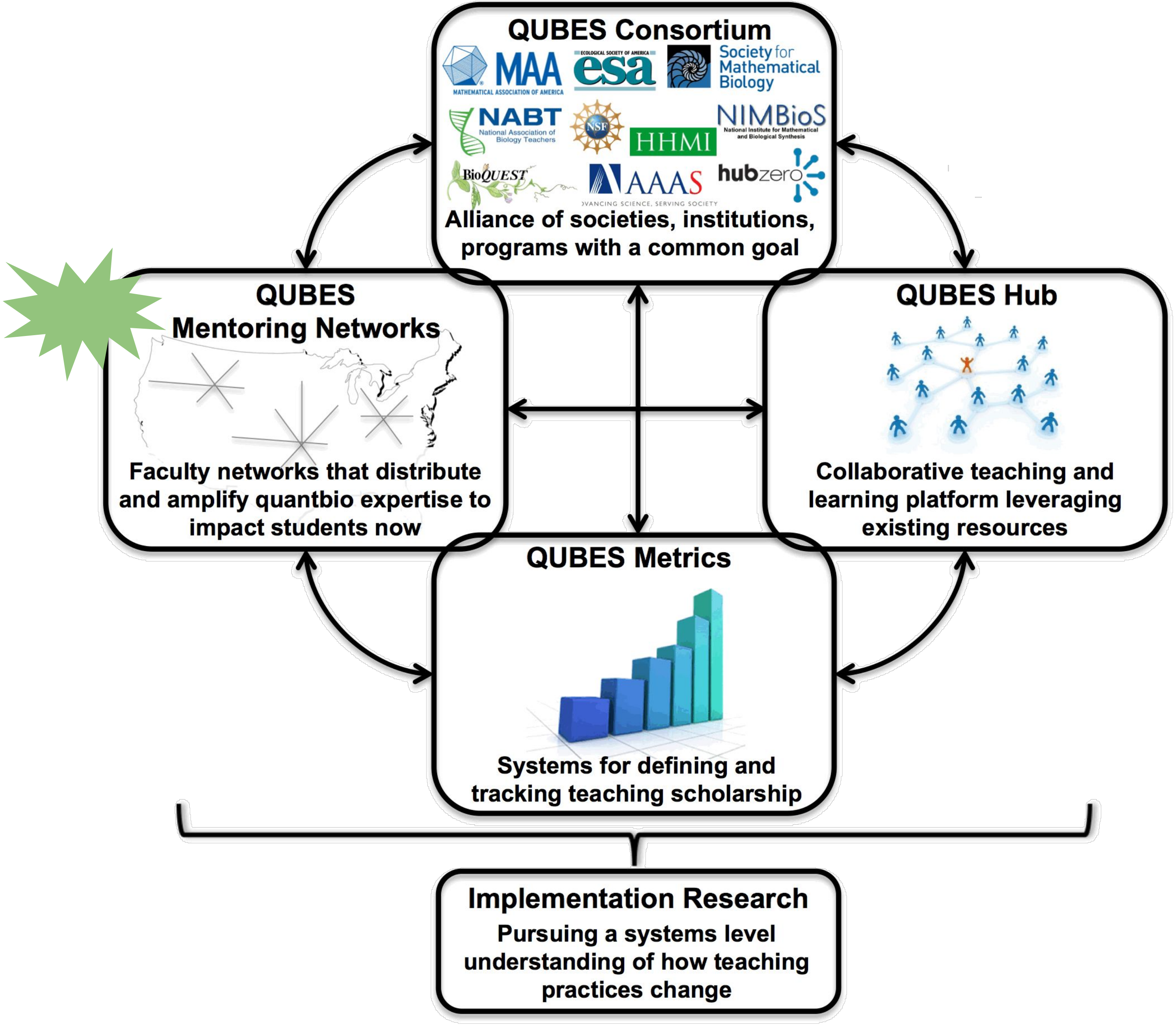
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QUBES Consortium

Alliance of societies, institutions, programs with a common goal

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Faculty networks that distribute and amplify quantbio expertise to impact students now

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Collaborative teaching and learning platform leveraging existing resources

QUBES Metrics

Systems for defining and tracking teaching scholarship

Implementation Research

Pursuing a systems level understanding of how teaching practices change

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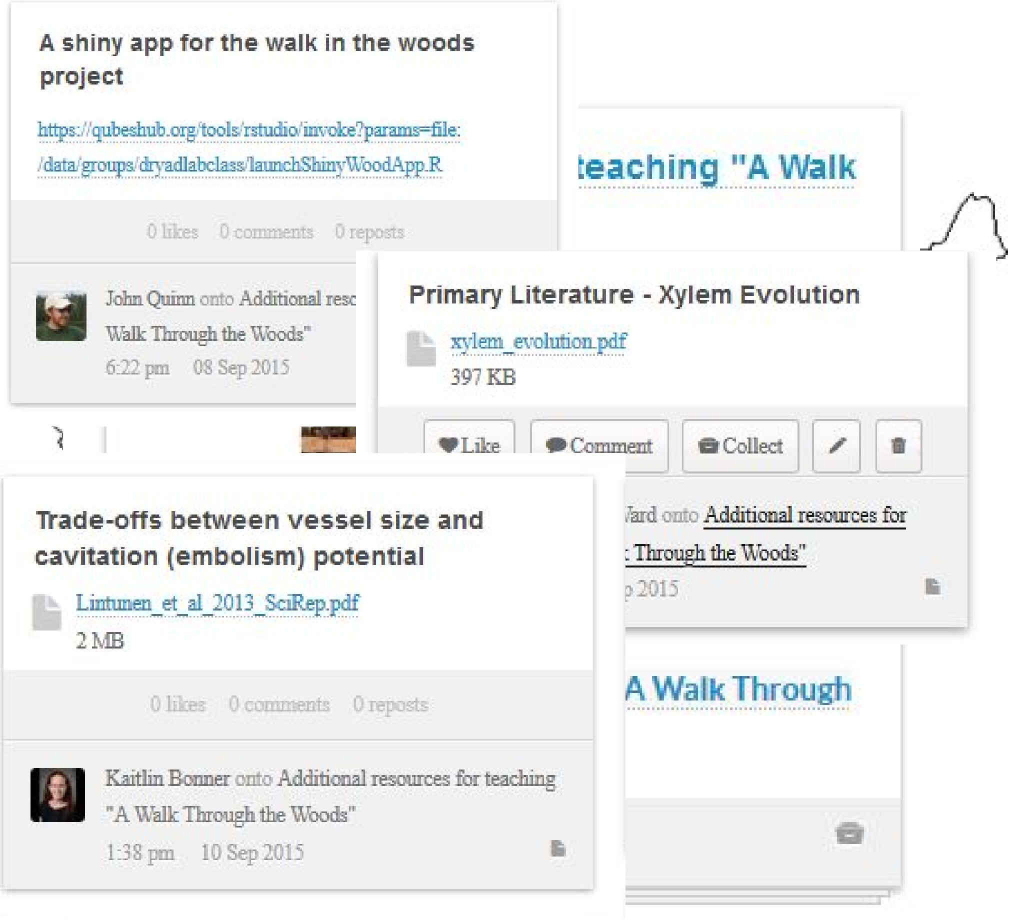
Providing a Community of Support: QUBES Faculty Mentoring Networks



A shiny app for the walk in the woods project

https://qubeshub.org/tools/rstudio/invoke?params=file:/data/groups/dryadlabclass/launchShinyWoodApp.R

0 likes 0 comments 0 reposts

John Quinn onto Additional reso
Walk Through the Woods"
6:22 pm 08 Sep 2015

teaching "A Walk

Primary Literature - Xylem Evolution

xylem_evolution.pdf
397 KB

ard onto Additional resources for
Through the Woods"
p 2015

Trade-offs between vessel size and cavitation (embolism) potential

Lintunen_et_al_2013_SciRep.pdf
2 MB

0 likes 0 comments 0 reposts

Kaitlin Bonner onto Additional resources for teaching "A Walk Through the Woods"
1:38 pm 10 Sep 2015

A Walk Through

- Online groups, typically 10-15 faculty members
- Focused on a specific topic or material
- Typically meet every two weeks over a period of several months

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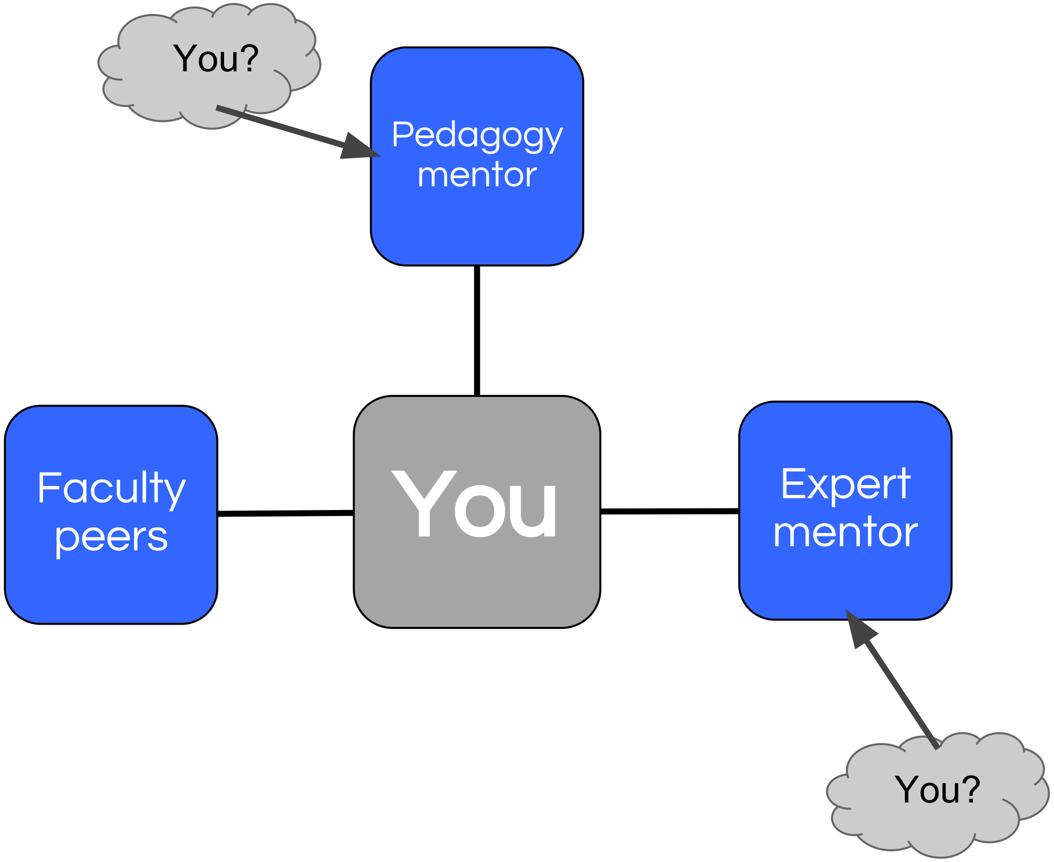
Providing a Community of Support: QUBES Faculty Mentoring Networks



- Led by teams of expert content and pedagogy mentors
- Learn skills and also get sustained support through adoption, adaptation, and implementation.

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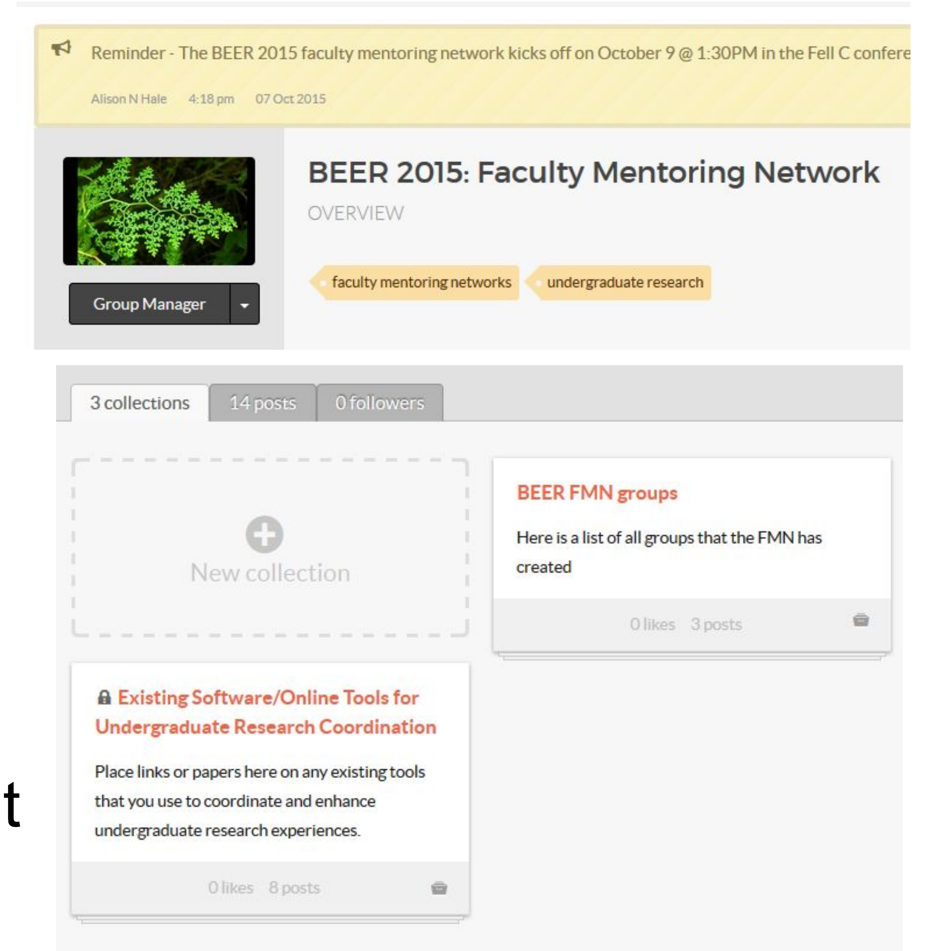
Providing a Community of Support: QUBES Faculty Mentoring Networks

BEER 2015 faculty mentoring network



Reminder - The BEER 2015 faculty mentoring network kicks off on October 9 @ 1:30PM in the Fell C confere

Alison N Hale 4:18 pm 07 Oct 2015

BEER 2015: Faculty Mentoring Network

OVERVIEW

BEER FMN groups

Here is a list of all groups that the FMN has created

Existing Software/Online Tools for Undergraduate Research Coordination

Place links or papers here on any existing tools that you use to coordinate and enhance undergraduate research experiences.

What topic would you like to see at next year's BEER?

Upcoming Faculty Mentoring Networks

Bringing quantitative reasoning into introductory biology

Join us at NABT 2015 and learn how to promote the application of quantitative reasoning skills in your intro bio classrooms!

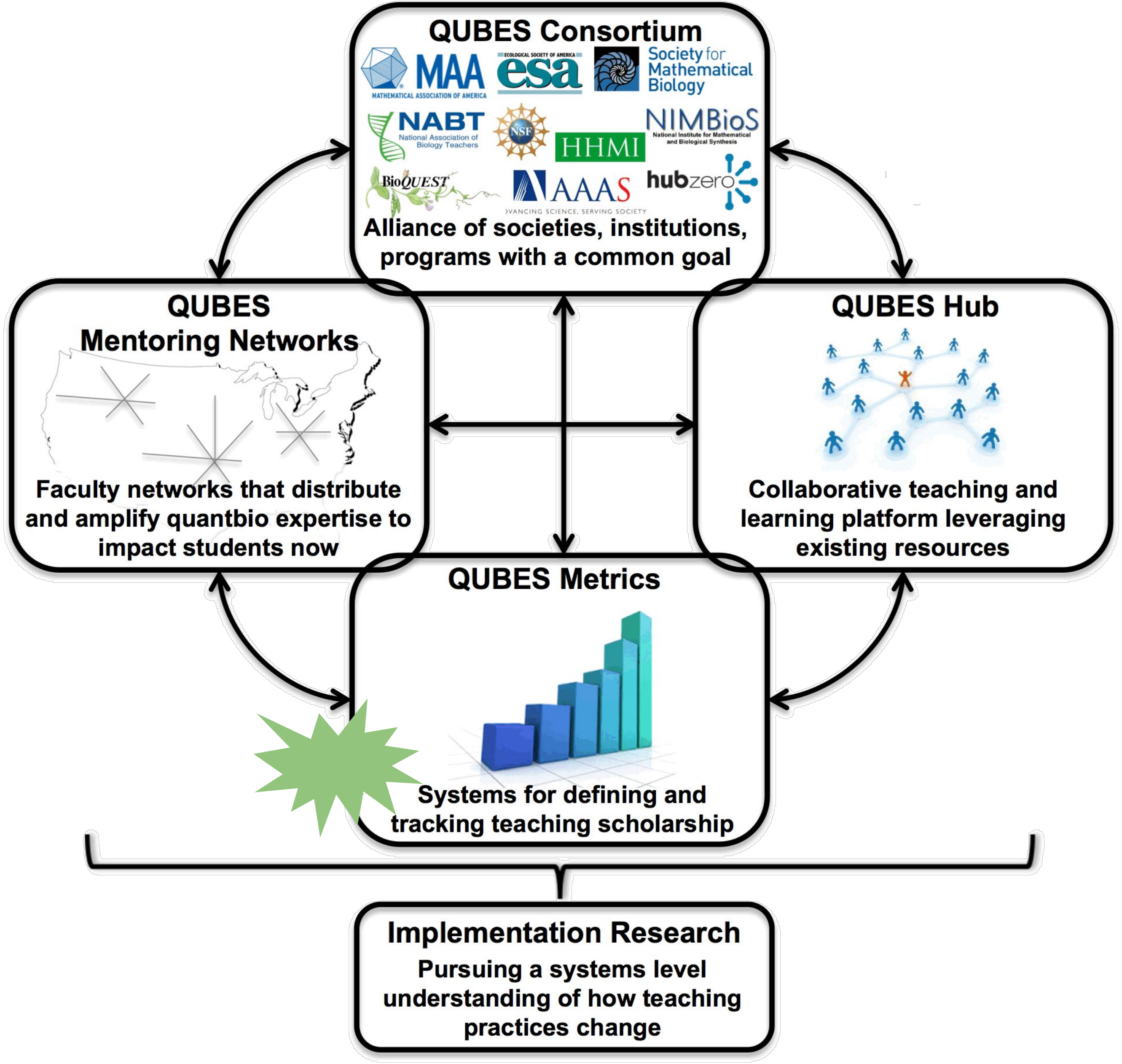
Grounding your Biology: InTeGrate Geology and Biology

InTeGrate
Interdisciplinary Teaching about Earth for a Sustainable Future

Use data driven modules to teach sustainability!

Motivating quantitative biology with open-inquiry image analysis

Learn the basics of image analysis, teach fascinating biology research stories, and get students motivated to do math and stats!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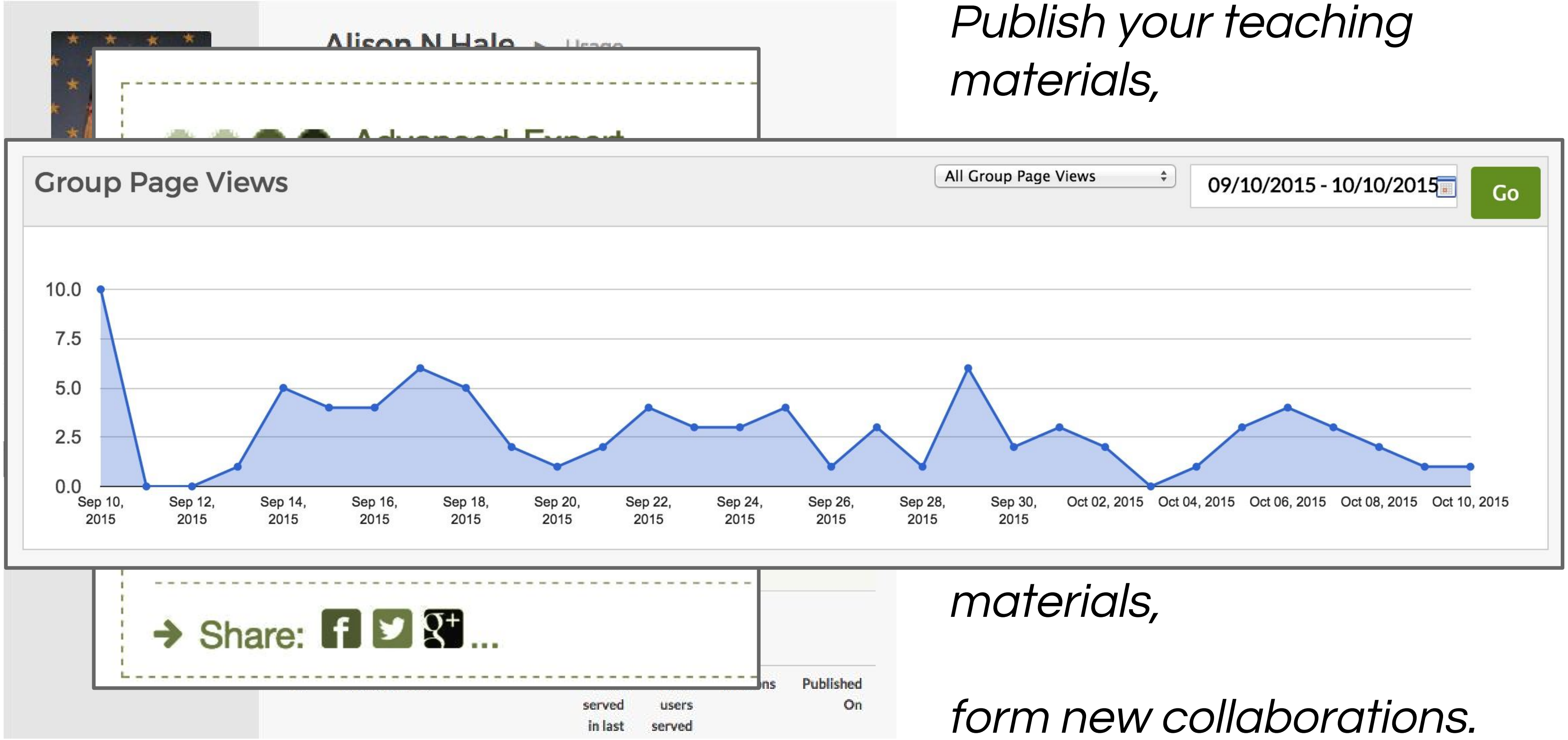
Metrics of Success:
Build a Teaching Scholarship Profile



Publish your teaching materials,

materials,

form new collaborations.

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We depend on an active community

- We are looking for community leaders.
- We are looking for creative ideas.
- We are looking for pilot projects.

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For More Information

- **Hub Team**

M. Drew LaMar (W&M)

Bob Sheehy (Radford U)

DB Poli (Roanoke College)

Carrie Eaton Diaz (Unity)

Jennifer Cartier (Unity)

HubZero

- **Mentoring**

Sam Donovan (UPitt)

Jeremy Wojdak (Radford)

Kristin Jenkins (BioQUEST)

Alison Hale (UPitt)

Arietta Fleming-Davies (Radford)

Gaby Hamerlinck (BioQUEST)

- **Metrics**

S. (Tom) Gower (UNC)

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You’ve gone too far!!!!

Back up!!

Danger lies ahead!

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Vision for QUBES Hub

1. **Foster collaboration beyond silos**
2. A hub/repository for multiple types of curriculum/research objects, such as:
   a. labs, data, modules, assessments
   b. web-based software tools
   c. implementation guides
3. Tagging system, a powerful search engine and fluid content navigation tools
4. Ability for peer review (informal)

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