Faculty Mentoring Networks: A model for professional development in undergraduate quantitative biology education

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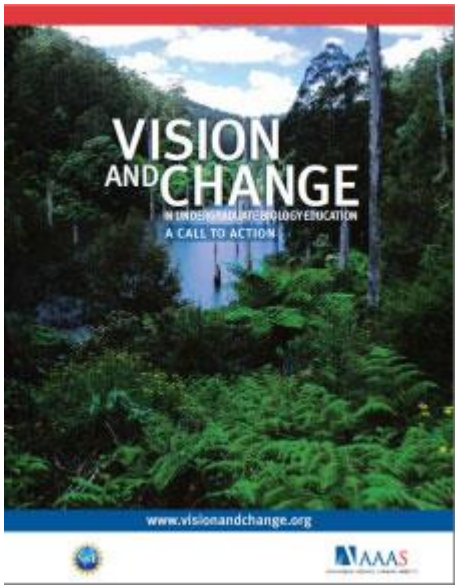
Faculty development is critical for change in undergraduate education

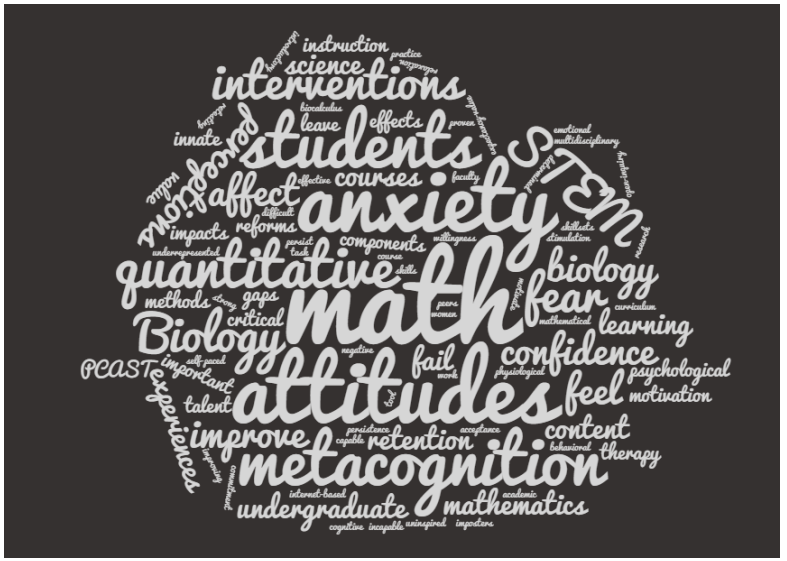
"**Professional development… can help all biology faculty become more effective teachers** and ensure that all students… develop the ability to think critically, to evaluate evidence, and to graduate, at a minimum, with a basic understanding of core biological principles." – Vision and Change



AAAS 2011

One area where faculty development is especially important: Quantitative Biology

- Faculty barriers
  - Feel unprepared to teach quantitative reasoning
  - Overwhelmed by initial effort to learn new quantitative skills
- Student barriers
  - Math anxiety



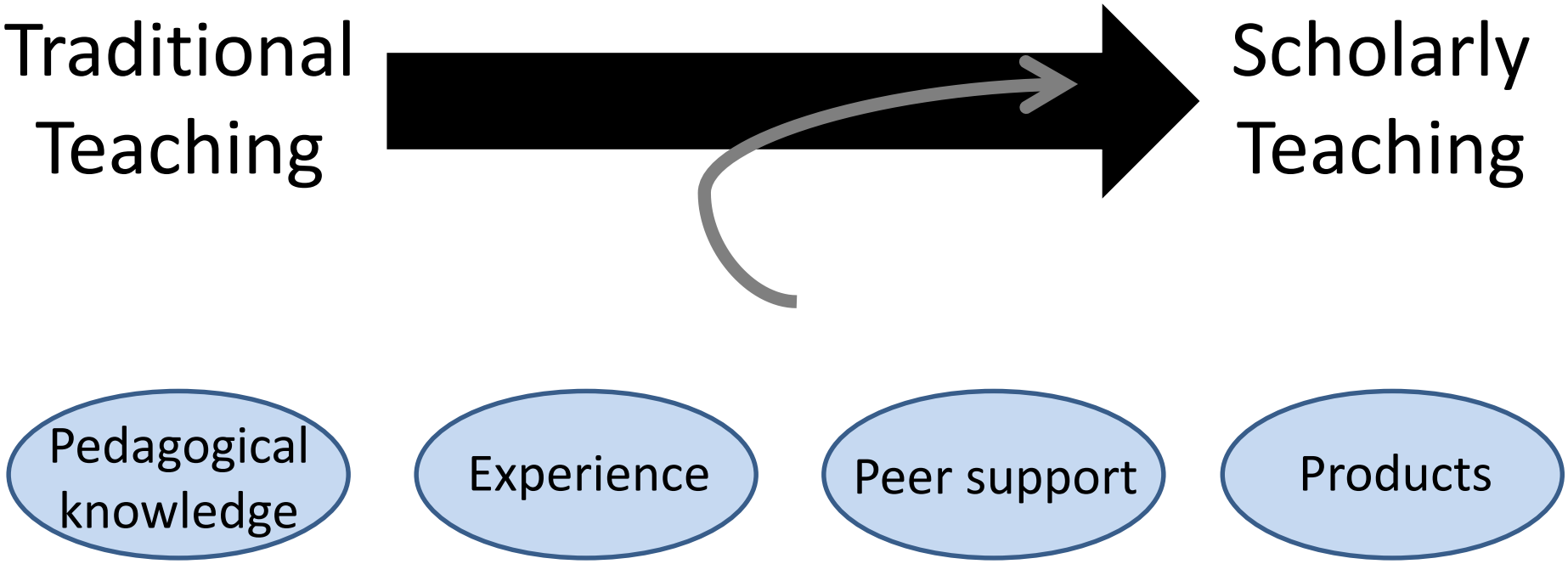
QUBES supports faculty development in Quantitative Biology

Quantitative
Undergraduate
Biology
Education and
Synthesis

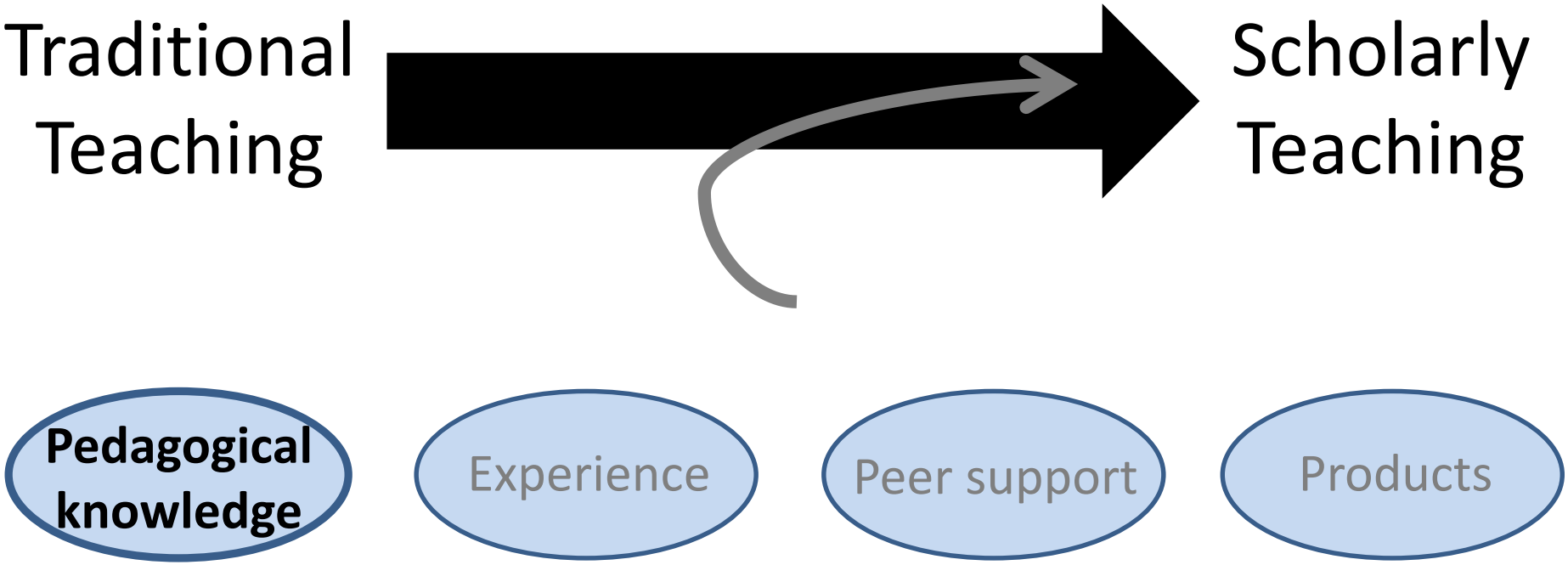
QUBES
The Power of Biology × Math × Community

qubeshub.org

QUBES model for faculty development

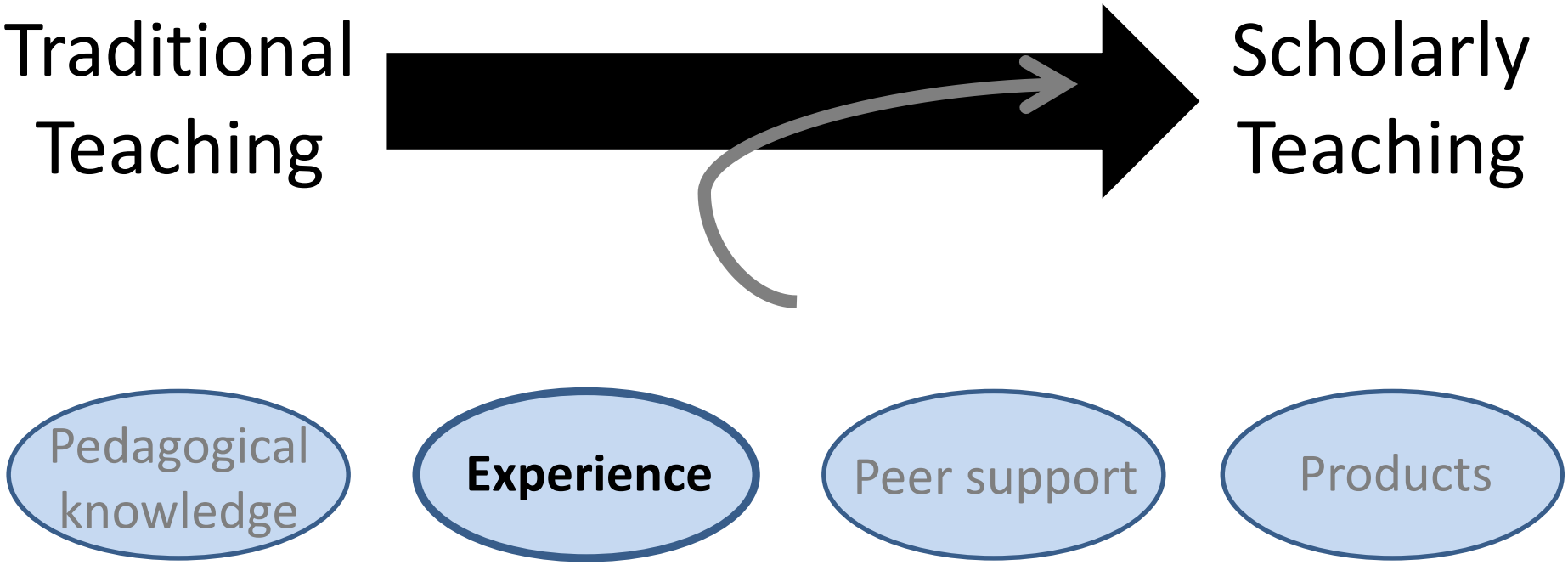


QUBES model for faculty development



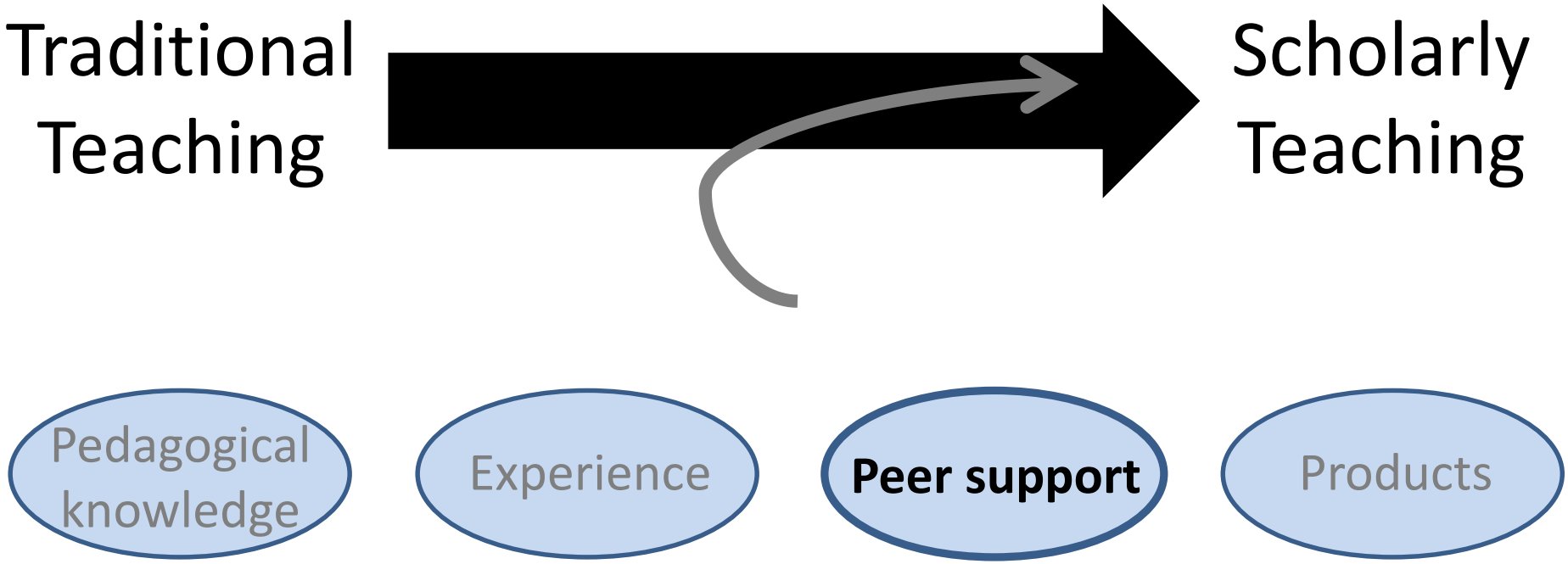
Engage with a rich collection of pedagogical tools

QUBES model for faculty development



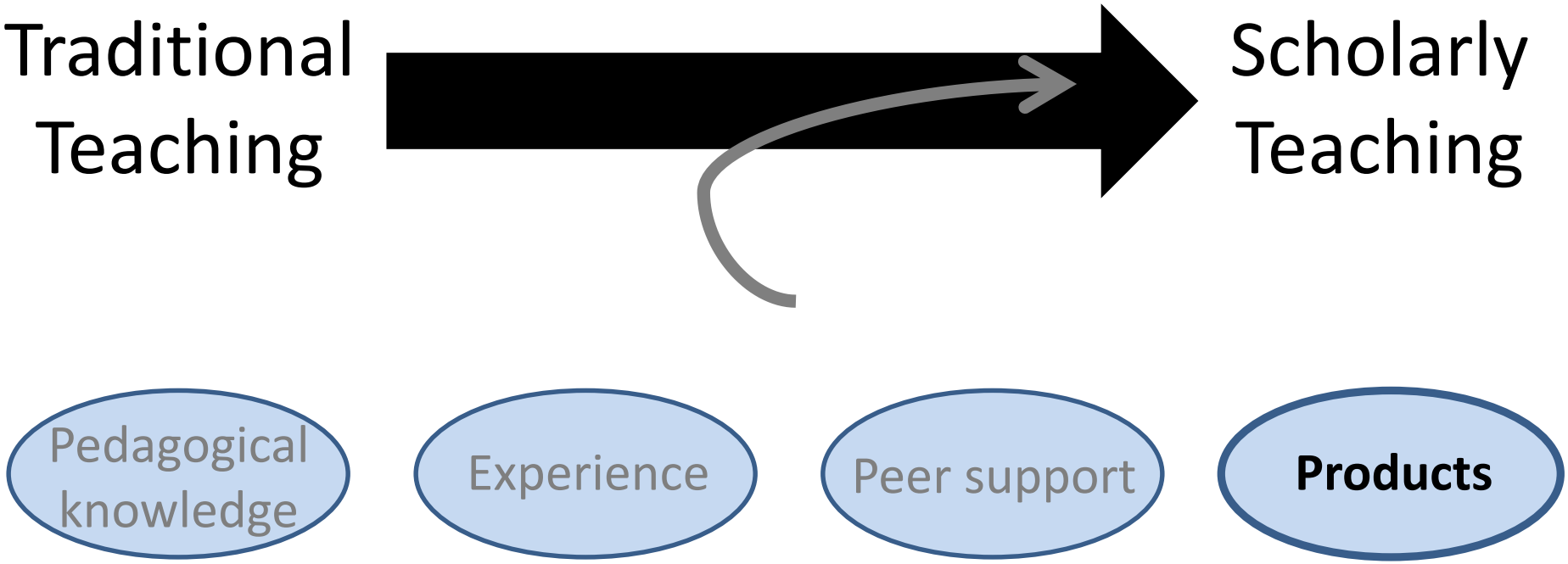
Adapt and implement new pedagogical techniques

QUBES model for faculty development

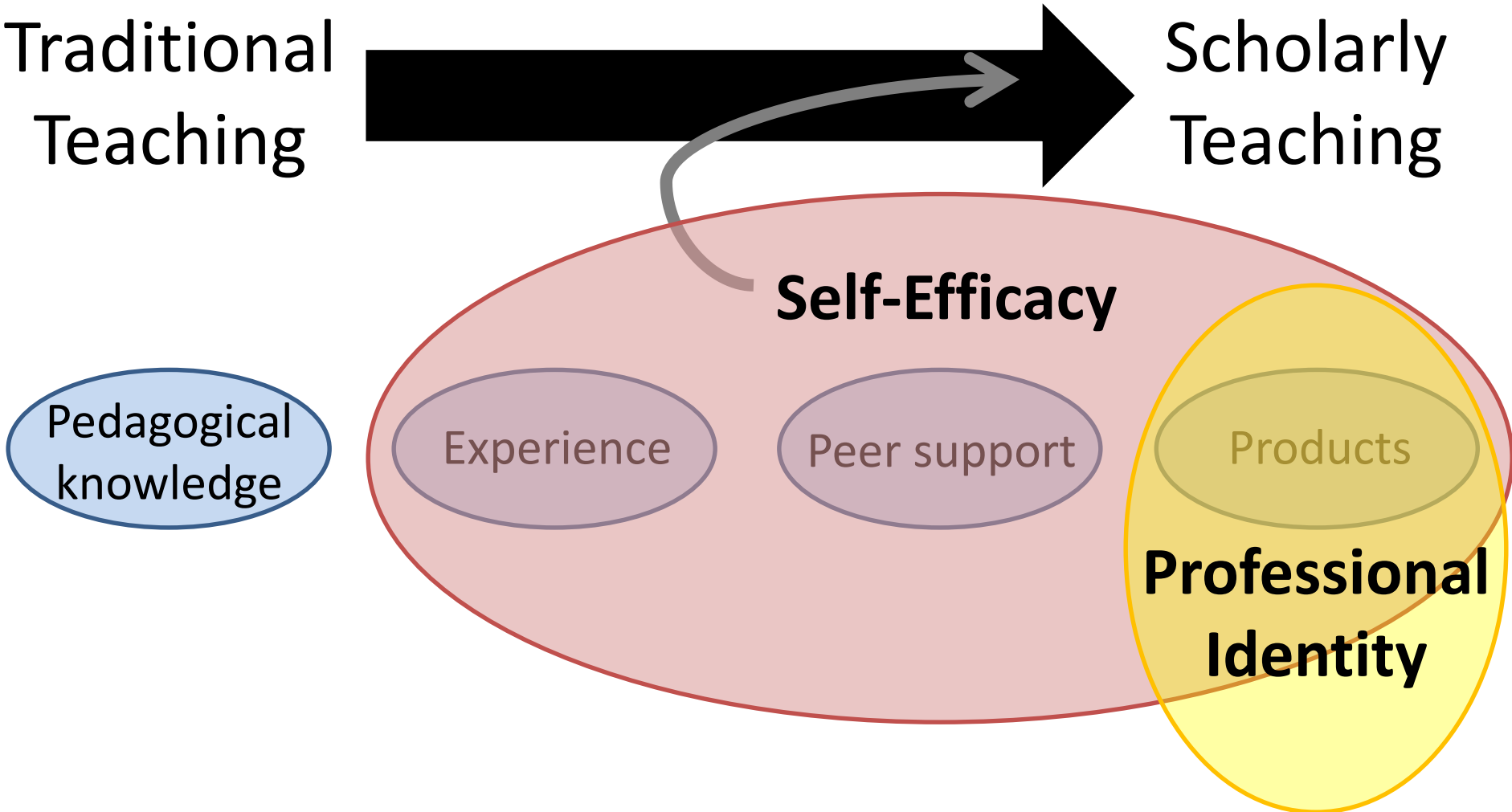


Peer support builds faculty confidence to change

QUBES model for faculty development



QUBES model for faculty development



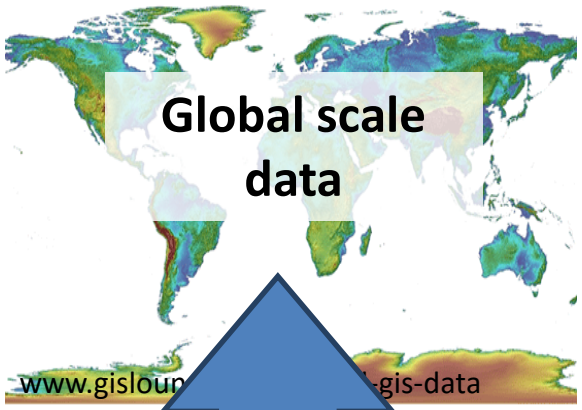
Existing models of faculty development

Model	Pedagogical Knowledge	Experience	Peer support	Products
Professional Society workshop	New tools and techniques	1-2 days	Limited timeframe for connecting w/ others	Certificate
NAS Summer Institute	New tools and techniques	1 week	Limited timeframe for connecting w/ others	Certificate
Local Learning Community	New tools and techniques	Through adaptation and implementation	Establish relationships with others	Local peer recognition

Faculty Mentoring Networks (FMNs): Exploring faculty development

- Challenges across all of these models:
  - Teachers are in diverse settings
  - Limited professional development time
  - Connecting people at a distance

Case study #1:
ESA Faculty Mentoring Networks



TIEE

ECOLOGICAL SOCIETY OF AMERICA esa

Global temperature change
(Taub & Graham 2011)

Lake ice and global change
(Bohanan et al. 2005)

Avian local species richness
(Langen 2012)

Climate change effects on phenology
(Calinger 2014)

Population dynamics of bald eagles
(Beckstead et al. 2011)

Cemetery demography
(Lanza 2012)

PVA of a local plant population
(Charney & Record 2013)

Modules available at: http://tiee.esa.org

Case study #2:
DryadLab Faculty Mentoring Networks

An Introduction to Extinction and Extinction Bias

Data from: Price and Gittleman. 2007. Hunting to extinction: biology and regional economy influence extinction risk and the impact of hunting in artiodactyls. *Proceedings of the Royal Society B* 274: 1845-1851.

Two more DryadLab modules available at: https://qubeshub.org/groups/dryadlab/resources

Pedagogical knowledge

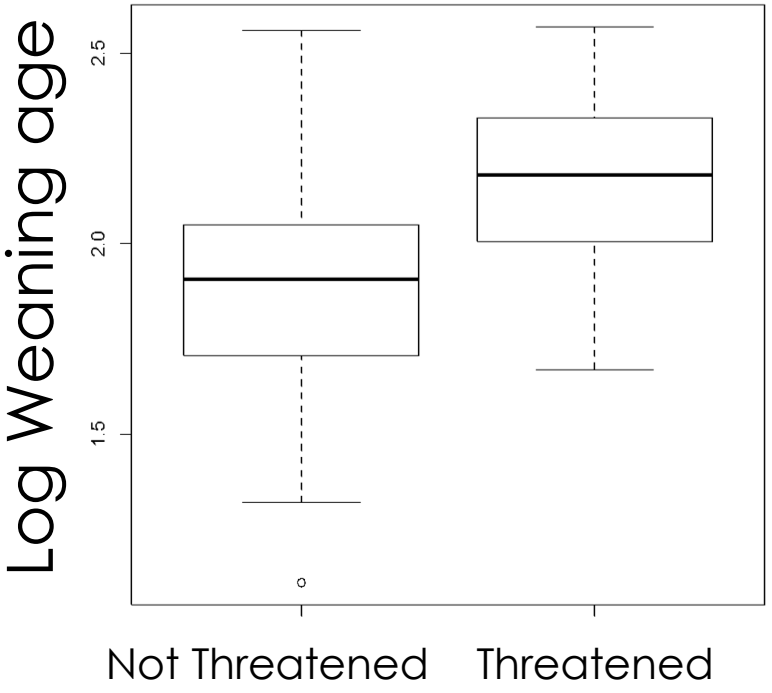
FMNs work from a rich collection of resources

DryadLab FMN example

"Introduction to Extinction and Extinction Bias"

Includes:

- Hypothesis-driven, group activity for students
- Student learning outcomes
- Notes to faculty



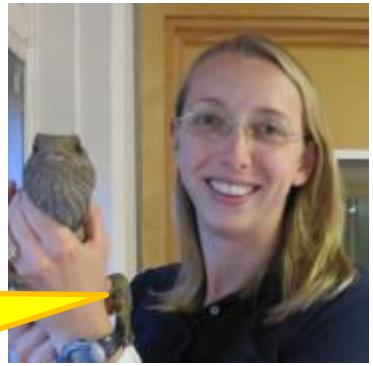
Pedagogical knowledge

FMNs encourage faculty to adapt the resources

"Because my class time is short I had to post a pre-recorded lecture for my students to watch to get the background they need to be successful during the module."

Kaitlin Bonner
St. John Fisher College

"For the Extinction module, we will be modifying the instructions for in[illegible]tation in JMP."

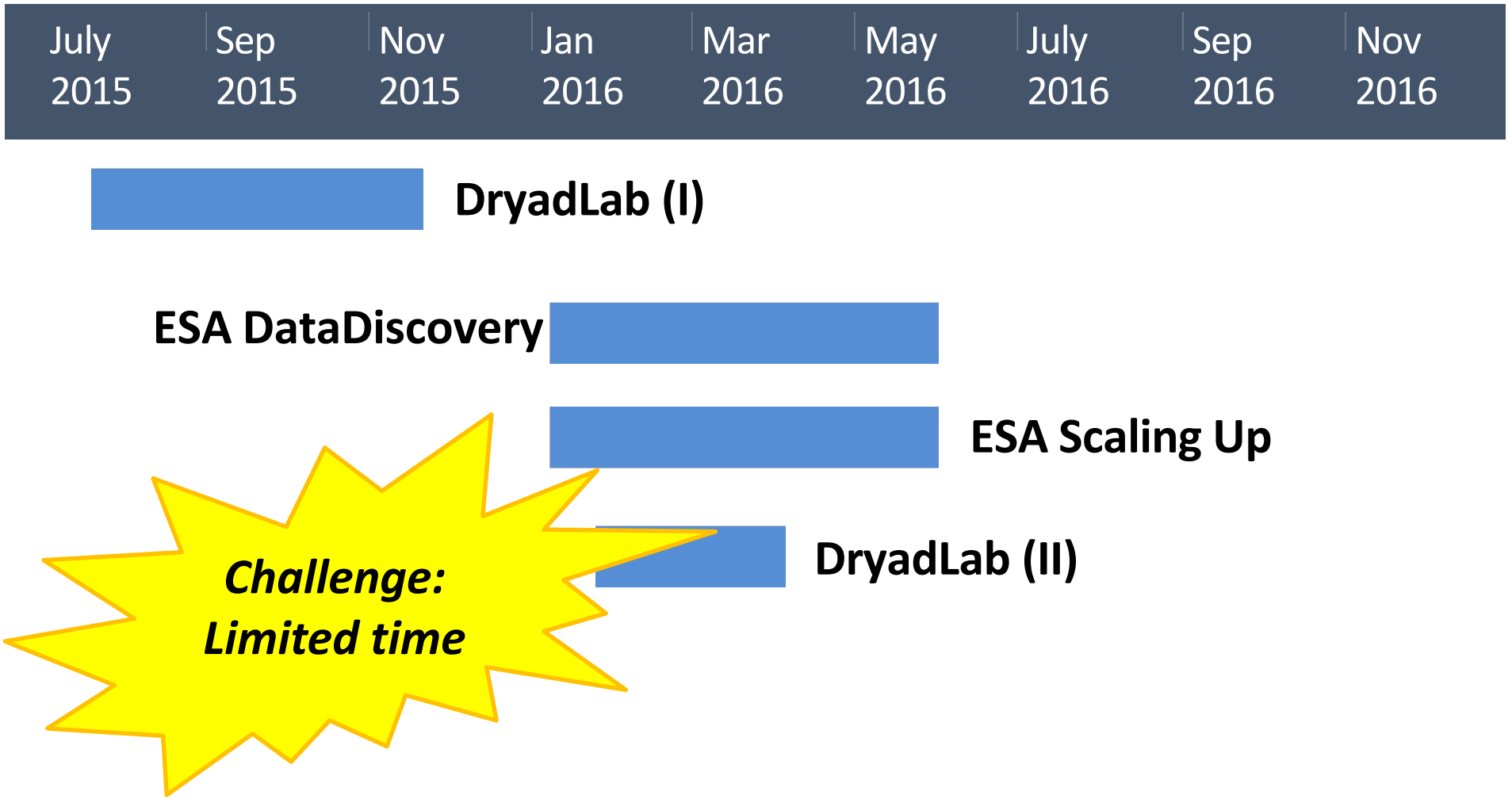


Kristine Grayson
University of Richmond

Challenge: Diverse teaching contexts

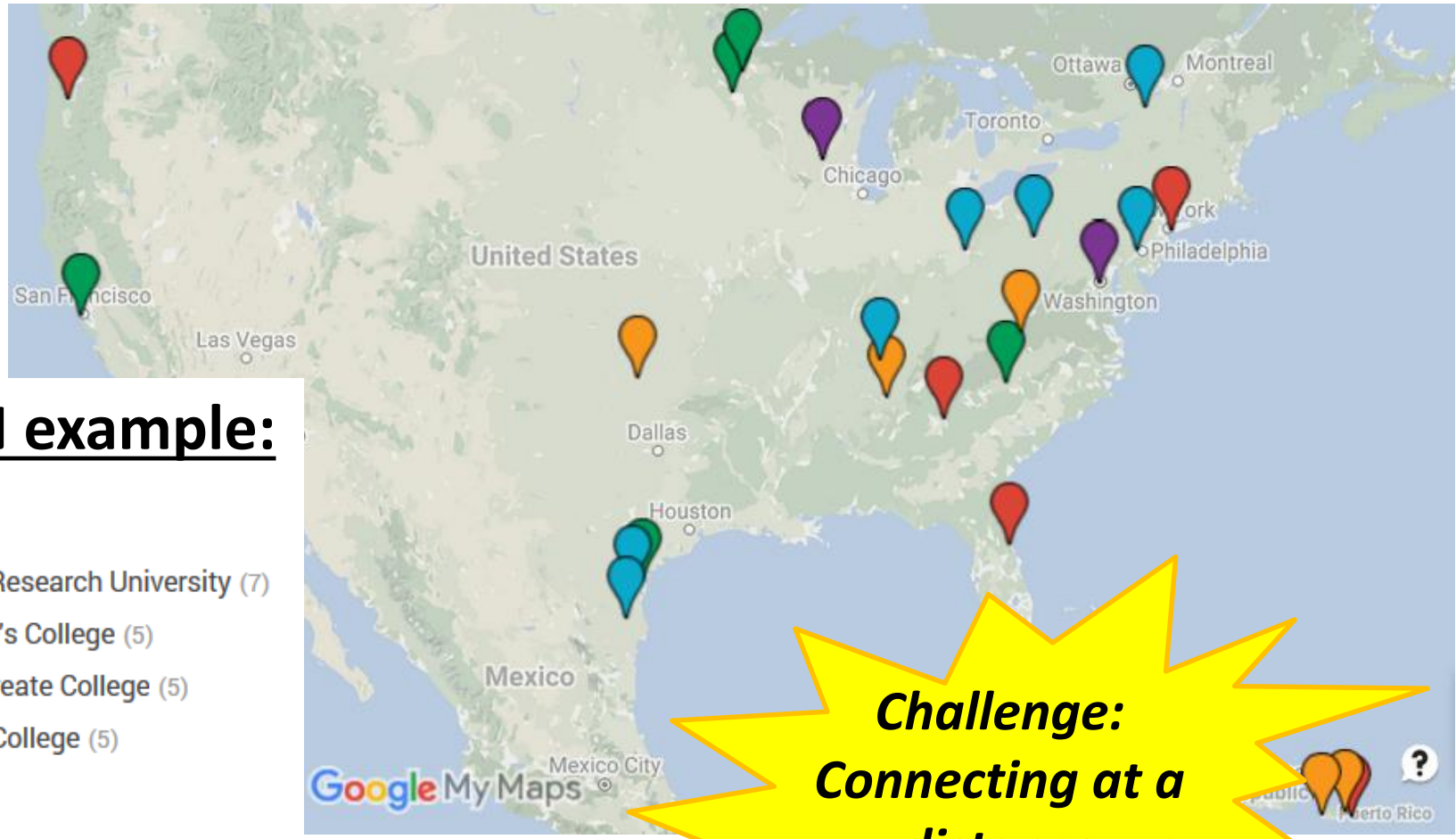
Experience

FMNs support faculty through implementation



Peer support

FMNs connect a diverse community of faculty



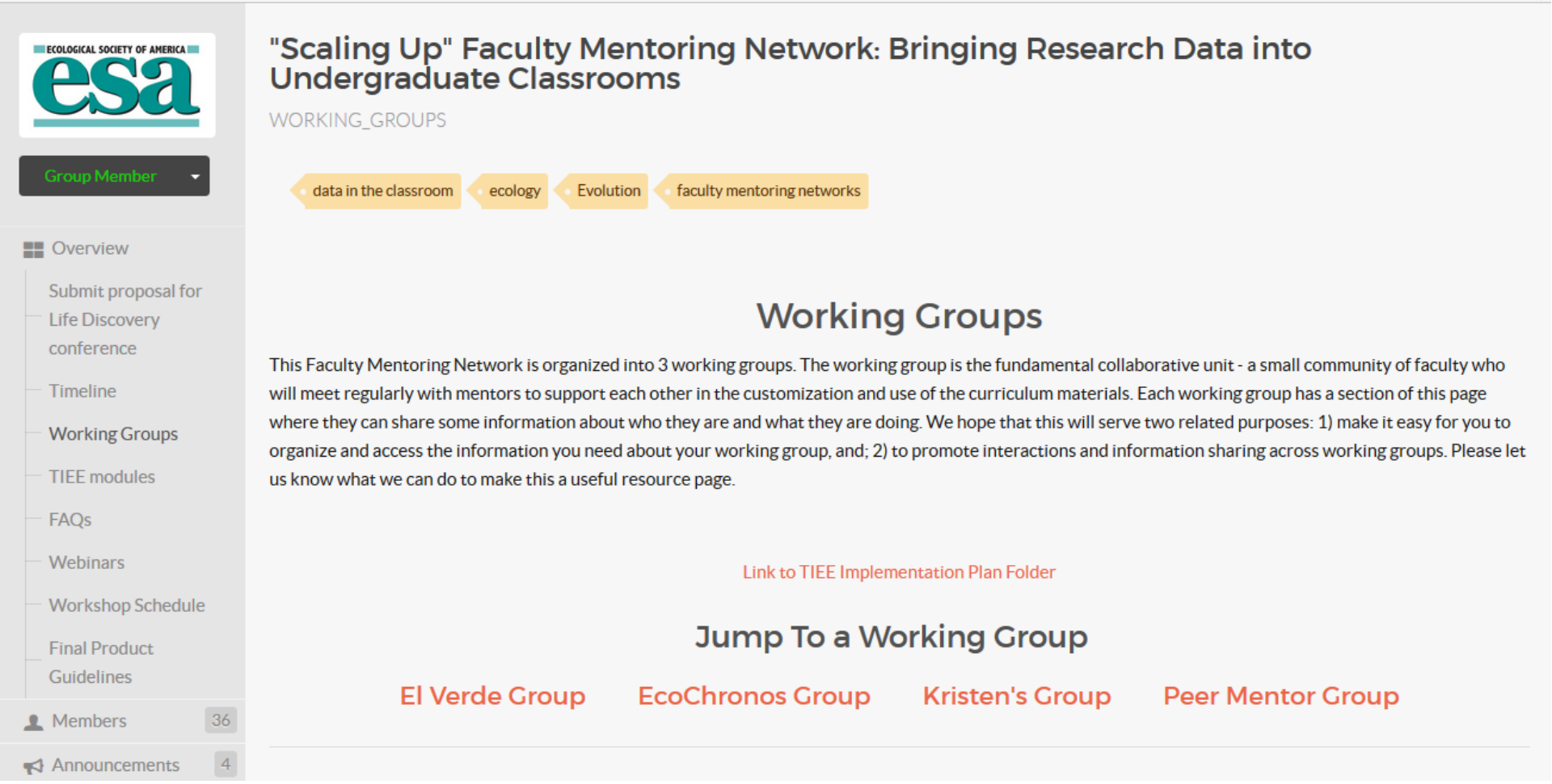
ESA FMN example:

- Doctoral Research University (7)
- Associate's College (5)
- Baccalaureate College (5)
- Master's College (5)
- Other (2)

Challenge: Connecting at a distance

Peer support

FMNs live online



https://qubeshub.org/groups/scalingup

Peer support

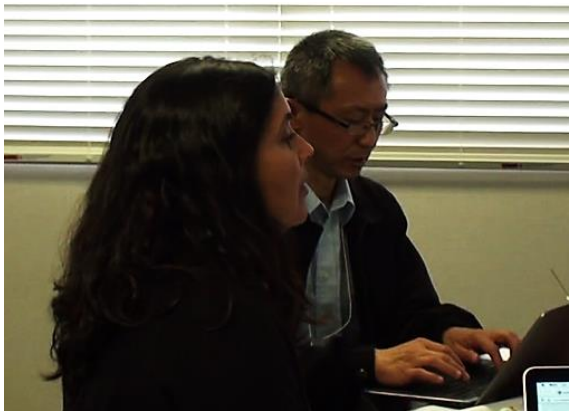
FMNs live online

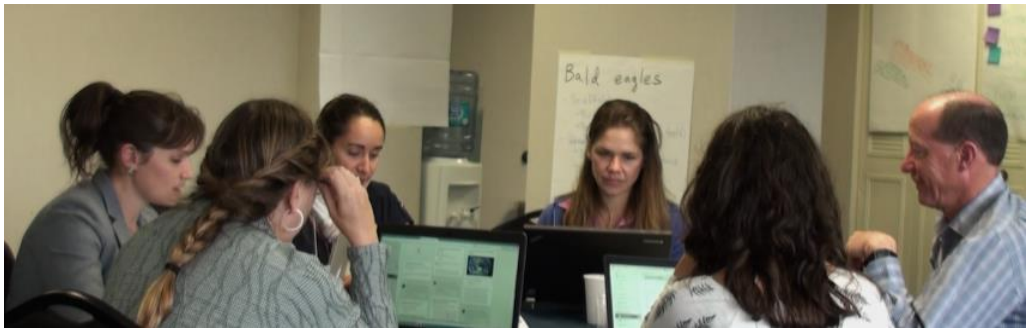
"I was able to bounce ideas off the other members, and we shared ways in which we addressed certain issues or concerns with the modules and with our student bodies. This gave me more confidence in implementing the module."
– ESA FMN participant

Google Hangout meetings every 2 weeks

Peer support

When possible, FMNs also meet in person





This was a great experience! Please try to keep the in-person meeting if you do this again!
Attending the LDC was also very useful!
– ESA FMN participant

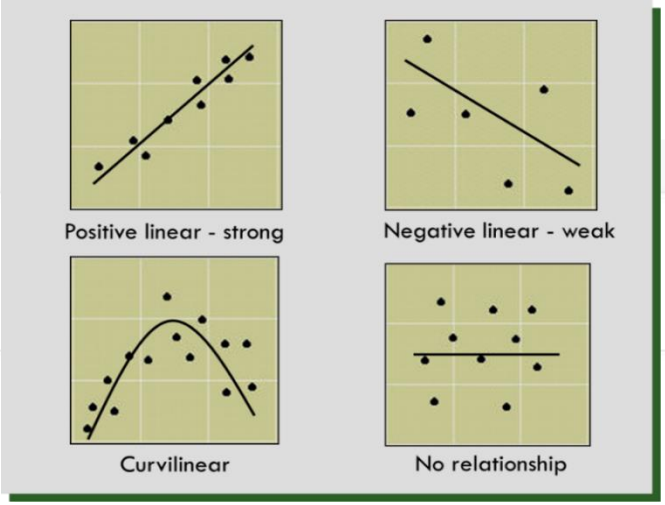
Products

FMNs help faculty generate products

QUBES
The Power of Biology × Math × Community

Home

ESA FMN Product



James Vance created this post
11:14 am 09 May 2016

Quadratic Regression

Quadratic_Regression.pptx
515 KB

This is a PowerPoint presentation that I put together to get our freshman Biological Diversity Lab (4 hours) students up to speed for the bald eagle lab. It covers how to determine which models and variables are statistically significant as well as quadratic regression. This is a 30 minute presentation to be used in the 1 hour of lecture and 3 hours of lab (4 hours total) course that a biologist and I (mathematician) co-taught. We have about 15 students in each of two lab sections. Feel free to modify in any way to suit your needs.

quadratic regression statistically significant model

https://qubeshub.org/collections/posts/1454

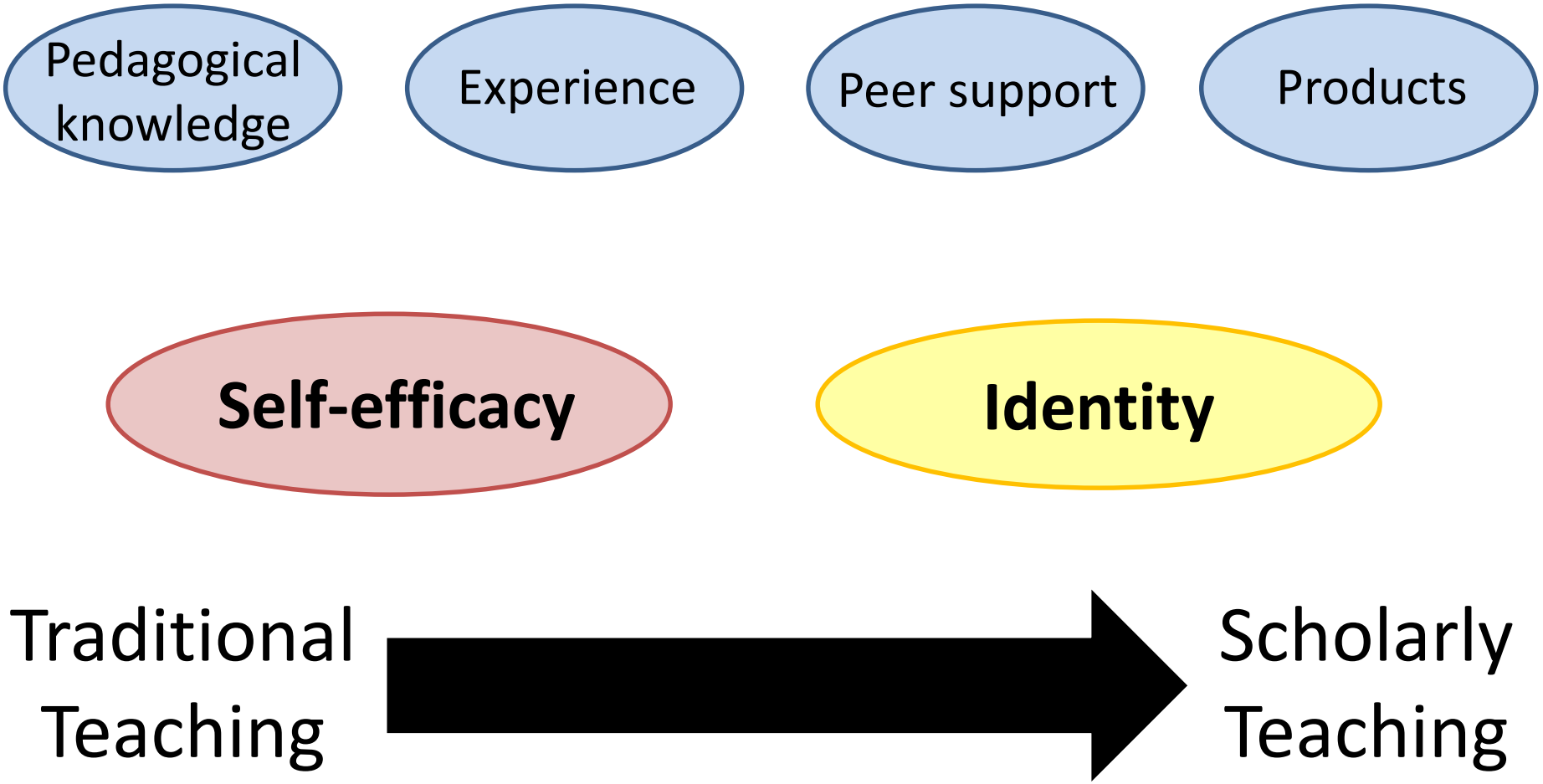
FMN benefits: Faculty Perspective

ESA FMN example:

1. **What aspects of this faculty mentoring network experience were most beneficial?**
   - **Access to new materials**
   - **Networking with peers with similar interests**
2. **Would you participate in another?**
   - **10/11 Yes**
3. **Would you recommend to colleague?**
   - **11/11 (100%) Yes**

*11 out of 13 participants took post-survey

Outcomes of a FMN experience



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- The QUBES partners
  - Ecological Society of America
  - DryadLab

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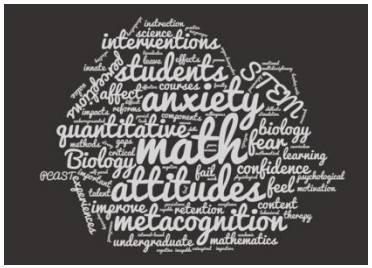
For information on current and upcoming faculty mentoring networks…

- Fall 2016 networks:
  - SimBio
  - HHMI BioInteractive
  - Math Attitudes and Anxiety

SimBio
Simulated Biology.
Real Learning.

hhmi
BioInteractive



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