Confronting the challenges of bringing research data into undergraduate classrooms using online faculty mentoring networks

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Motivation

Using ecological research data in undergraduate courses has many potential benefits for student learning. Students gain knowledge of ecological concepts, increased understanding of the scientific process, and meaningful opportunities to develop and practice quantitative skills (Langen et al. 2014). As ecological datasets continue to become larger and more complex, faculty may need additional support both to build their own skills and to teach effectively with research data.

ESAs-QUBES Partnership

The Ecological Society of America has partnered with the NSF-funded virtual center Quantitative Undergraduate Biology Education and Synthesis (QUBES). This project was funded by the NSF to prepare faculty to use data anticipated from the National Ecological Observatory Network (NEON) in undergraduate education and to diversify faculty and institutions involved in NEON science and education.

Faculty mentoring networks

- Faculty mentoring networks are online groups of faculty members led by expert content mentors, peer mentors, and QUBES liaisons
- Two parallel nationwide mentoring networks from January-May 2016
- “Data Discovery” network was online only
- “Scaling Up” network had online components plus an in-person workshop at the Life Discovery Conference on biology education
- Participants were recognized as ESA Education Scholars

Focal materials

- Global temperature change (Hubacek and Grubler 2006)
- Lake ice and global change (Hubacek and Grubler 2006)
- Avian local species richness (Langen 2012)
- Climate change effects on phenology (Krasny et al. 2013)
- Population dynamics of bald eagles (Bohanan et al. 2011)
- Cemetery demography (Kassen 2012)
- PVA of a local plant population (Chown and Arroyo 2011)

Outcomes

Participants from both “online-only” and “online + instructor workshop” mentoring networks consistently reported that the experience helped them use ecological research data in the undergraduate classroom.

Based on participant reporting of effects on their teaching, online-only mentoring networks might be as effective at helping faculty implement new quantitative materials as networks with an in-person workshop.

Participants reported the most beneficial aspects to be:
- Access to new curriculum materials (18 of 22 respondents)
- Networking with peers (16 of 22 respondents)
- In-person workshop (“Scaling Up” network only; 8 of 11 respondents)

95% of respondents from both networks were “more likely” or “much more likely” to introduce more quantitative reasoning skills or topics in other courses (Figure 1).

Most respondents from both networks would participate in another faculty mentoring network and would recommend them to colleagues (Figures 2 & 3): 20 of 22 respondents would recommend the workshop to a colleague.

Participants in the network that included an in-person workshop tended to dedicate slightly more time to network activities (Figure 4).

Both networks generated new use and customization of materials published up to 10 years ago, and documented that activity on the Ecolab Digital Library site. The outcomes of these networks provide evidence that faculty mentoring networks, including those conducted entirely online, are an effective format for promoting teaching scholarship.

References


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Participants in the “Scaling Up” mentoring network work together at the Life Discovery Conference in Baltimore, March 2016.

Participants implemented and adapted one or two of seven focal Teaching Issues and Experiments in Ecology (TIEE) modules, chosen to scale up from populations to communities to global ecosystems.

All of these resources, the advice from faculty in my network, and my previous experience teaching some of these skills, greatly increased my confidence to teach quantitative reasoning skills in a course with freshmen.”

-Faculty participant

TIEE module spotlight: Investigating the footprint of climate change on phenology and ecological interactions in north-central North America, Kellen Calfinger (2014)

In Calfinger’s module, students use long-term climate and flowering time data for plant species from Ohio to investigate the impacts of climate change on plant and animal phenology and diversity. The table highlights just a few of the adaptations participants made to this TIEE module during the faculty mentoring network. Find these at http://bit.do/qubeshub-esa-phenology

<table>
<thead>
<tr>
<th>Modification/new materials development</th>
<th>Course</th>
<th>Faculty member and institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citizen Science component; students contribute phenology data to Project Budburst</td>
<td>Non-major General Biology</td>
<td>Fumiko Saunderson, California State University, Moorpark, CA</td>
</tr>
<tr>
<td>Adaptation to online course environment; students participate in online discussions</td>
<td>Non-major Environmental Science (online)</td>
<td>Kristen Gomel, Alfred University, Alfred, NY</td>
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<tr>
<td>Citizen Science and connect to local species; students collect data for Campus Migratory Bird Phenology Project</td>
<td>Introductory Biology for majors</td>
<td>Carrie Kysman, St. Victor College, Leo, NY</td>
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<tr>
<td>Connecting data to primary scientific literature; students conduct a literature search</td>
<td>Introductory Biology for majors</td>
<td>Marija Balarammam, Ashland University, Ashland, OH</td>
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Check out the original materials at t.iee.org and related & modified materials at qubeshub.org/groups/esa/collections

What quantitative skills do you hope your students will gain from these materials? Word cloud made from network participants’ responses to this question.