Evaluation Report

Webinar--Math, Computing, Undergraduate Ecology Education and Large Datasets: An Example from a Citizen Science Program

September 8, 2010

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Executive Summary

Brief Synopsis of Event

A 45-minute webinar entitled "*Math, Computing, Undergraduate Ecology Education and Large Datasets: An Example from a Citizen Science Program"* was presented by NIMBioS Director Louis Gross and Postdoctoral Fellow William Godsoe on September 8, 2010. The webinar, hosted via LiveOnline@UT, was offered as one of several events prior to the Oct. 14-15 2010 Ecology and Education Summit, sponsored by ESA and the National Education Association in Washington, D.C.

The webinar focused on math and computational education for ecology undergrads and illustrated how a large field dataset can be used to motivate hypothesis formulation and assessment by undergraduates. This included a discussion of NIMBioS' Research Experience for Undergraduates (REU) program linking biology and math undergrads; discussion of a large citizen science project based in the Great Smoky Mountains National Park (Discover Life in America's All Taxa Biodiversity Inventory – ATBI); description of one ATBI large biodiversity dataset and how a small group of undergrads chose what to analyze and how to do so; and interview comments from the REU students about their learning process. The presenters emphasized how the data and analysis involved a multiplicity of concepts of biodiversity, the variety of questions raised by the students and the constraints on addressing them using the available data.

Evaluation Design

An electronic survey aligned to the following evaluation questions was designed by the NIMBioS Evaluation Coordinator with input from Dr. Godsoe:

1. Did participants find the information presented in the webinar useful?
2. Did the webinar meet participants' expectations?
3. Did participants felt they learned about the central topics of the webinar?
4. Did participants feel the presenter adequately addressed audience questions?
5. Were there any technical problems with the format of the webinar?
6. What topics would participants have liked to cover if given more time?
7. What topics would participants like to cover at future webinars?

The final instrument was hosted online via the University of Tennessee's online survey host mrInterview. Links to the survey were sent to 40 registered Webinar participants on September 9, 2010 (co-organizers were not included in the evaluation). Reminder emails were sent to non-responding participants on September 15 and 17, 2010. By September 24, 2010, 33 of the registered participants had given their feedback, for a response rate of 83%.

An electronic demographic survey aligned to the reporting requirements of the National Science Foundation was designed by the NIMBioS Evaluation Coordinator with input from the NIMBioS Director. The final instrument was hosted online via the University of Tennessee's online survey host mrInterview. Links to the survey were sent to the 33 webinar participants who had not

previously attended a NIMBioS event on September 1, 2010. Reminder emails were sent to non-responding participants on September 3 and 7, 2010. By September 8, 2010, 33 participants had filled out the survey for a response rate of 100%. Demographic questions regarding gender, race, and ethnicity, and disability status were optional (disability status is not reported in this evaluation report). All demographic information is confidential, and results are reported only in the aggregate. When feasible, the evaluator filled in missing demographic data from other sources (e.g. address, institution, field of study). The evaluator did not assume race, ethnicity, or disability status for any participant who did not report this information.

Highlights of Results

- Participant expectations for the webinar included learning how to use large datasets in undergraduate ecology classes and how to incorporate citizen science projects into the classroom.

- 64% of respondents felt as though the webinar met their expectations.

- The majority of respondents (52%) said they felt that participating in the webinar helped them better understand the importance of mathematics in undergraduate biology education.

- 97% of respondents indicated they felt sufficient opportunity was given for questions and comments from the audience, and that the questions from the audience were answered well.

- 40% of respondents indicated having some sort of technical experience while accessing the webinar. The most common complaint dealt with audio problems.

- If given more time, participants would have liked to have gotten more specific information about how to translate the REU example into a project for a large undergraduate ecology classroom.

- Other suggestions for future webinar topics included information about other available datasets available for classroom use, statistics for undergrad teaching, and how to overcome differences in mathematics skills of undergrad biology students.

Conclusions and Recommendations

The majority of the webinar participants found the information presented useful and relevant, but indicated they would like more detailed information about translating the webinar's REU and ATBI examples into something they could use in their own undergraduate courses. Most participants indicated coming to the webinar with expectations of getting a "how-to" tutorial with specific information about how to use large datasets in teaching undergraduates. While participants thought the webinar provided good ideas about increasing quantitative literacy in ecology students, their comments suggested they were unsure about how to translate what was covered in the webinar into their own teaching.

Respondents reported varied levels of learning about the topics, with an average of 58% of respondents agreeing that they learned more about the central topics of the webinar. While the many respondents agreed that they had a better understanding of how math can make biological ambiguities more concrete, some respondents said they either did not gain understanding, or felt "neutral" or about the amount of understanding they gained on the topics, while a small number disagreed that they learned anything about these topics. Several respondents who indicated they didn't feel like they learned much about the central topics, however, indicated that they were already knowledgeable about them.

Almost half of the participants indicated experiencing some sort of trouble with the technology used to present the webinar. The most common issues were the audio not working properly, while others indicated they had trouble loading images from the presentation.

For future webinars, participants indicated they would to have more specific details and examples of how to use the information in undergraduate classes. Other suggestions for future webinar topics included information about other available datasets available for classroom use, statistics for undergrad teaching, and how to overcome differences in mathematics skills of undergrad biology students.

Based on analysis of participant response data, the recommendations are as follows:

- There is significant interest in the topic of the current webinar. Continue to offer webinars in this subject area, but consider narrowing the focus to specific ways (perhaps with examples) in which large datasets or other citizen science projects could be used in undergraduate classrooms.

- Consider providing a list of resources on the NIMBioS website for undergraduate educators interested in finding datasets to use in their classrooms.

- If using the same technology for future webinars, consider looking into the cause of the audio issues to determine where the problems lie and how to fix them.

EcoED Webinar Evaluation Report

Background

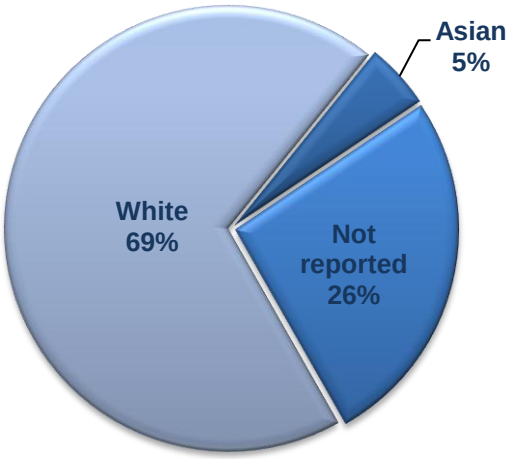
A 45-minute webinar entitled "*Math, Computing, Undergraduate Ecology Education and Large Datasets: An Example from a Citizen Science Program"* was presented by NIMBioS Director Louis Gross and Postdoctoral Fellow William Godsoe on September 8, 2010. The webinar, hosted via LiveOnline@UT, was offered as one of several events prior to the Oct. 14-15 2010 Ecology and Education Summit, sponsored by ESA and the National Education Association in Washington, D.C.

The webinar focused on math and computational education for ecology undergrads and illustrated how a large field dataset can be used to motivate hypothesis formulation and assessment by undergraduates. This included a discussion of NIMBioS' Research Experience for Undergraduates (REU) program linking biology and math undergrads; discussion of a large citizen science project based in the Great Smoky Mountains National Park (Discover Life in America's All Taxa Biodiversity Inventory – ATBI); description of one ATBI large biodiversity dataset and how a small group of undergrads chose what to analyze and how to do so; and interview comments from the REU students about their learning process. The presenters emphasized how the data and analysis involved a multiplicity of concepts of biodiversity, the variety of questions raised by the students and the constraints on addressing them using the available data.

Participant Demographics

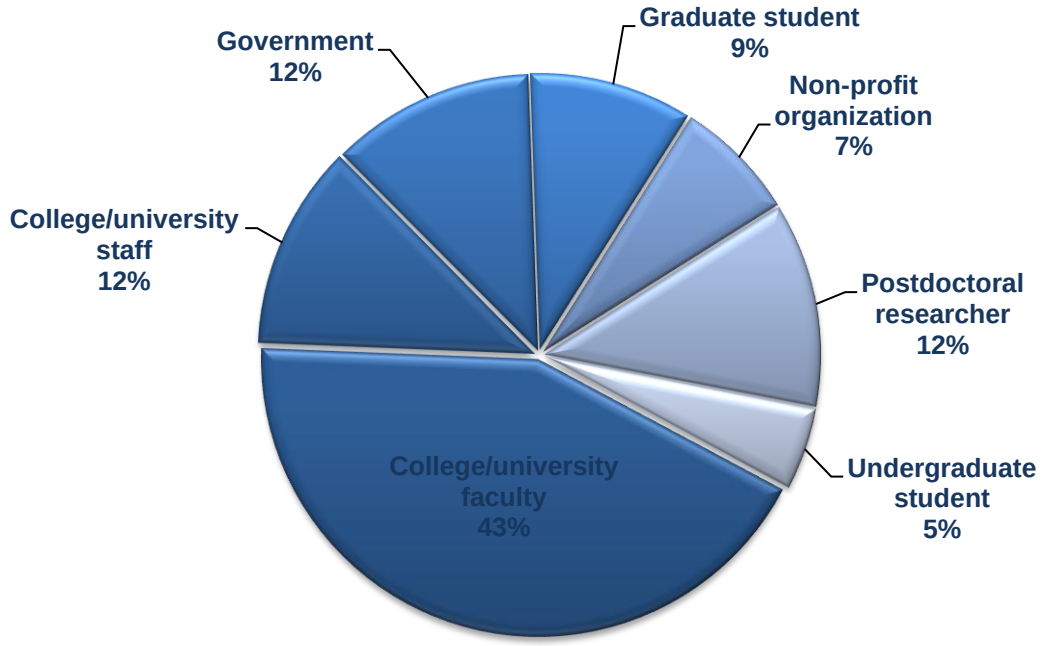
The 26 females and 16 males (one of whom self-identified as being of Hispanic/Latino ethnicity) mostly self-identified racially as white (Figure 1).

Figure 1. Racial composition of participants (n =42)



Many webinar participants were college/university faculty or staff, however, participants came from a wide variety of positions (Figure 2).

Figure 2. Status of participants (n=42)



Primary fields of study for the 42 participants included agricultural science/natural resources, biological/biomedical sciences, education, and mathematics, among others (Table 1).

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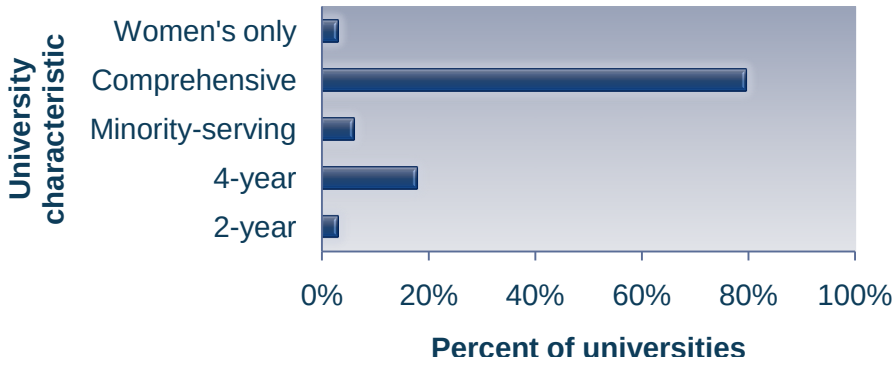
Table 1. Participant fields of study and areas of concentration

Field of Study	Concentration	# Participants
Agricultural Sciences/Natural Resources	Forest Sciences and Biology	1
	Forest/Resources Management	1
	Natural Resources/Conservation	3
	Wildlife/Range management	1
Biology/Biomedical Sciences	Mathematical Biology	1
	Biology/Biological Sciences, General	2
	Botany/Plant Biology	1
	Ecology	14
	Evolutionary Biology	2
	Neuroscience	1
	Plant Physiology	1
	Zoology	1
Chemistry	Analytical	1
Computer & Information Sciences	Computer Science	1
Education	Higher Education/Evaluation & Research	1
	Educational/Instructional Media Design	1
	Educational Leadership	1
Engineering	Computer Science	1
Mathematics	Applied Mathematics	2
	Mathematical Biology	2
Ocean/Marine Sciences	Ocean/Marine, General	1
Not reported		2

Participants represented 22 unique U.S. institutions across 15 states and the District of Columbia. Included in the institutions were 19 different universities, one non-profit, and two federal agencies. Of the 19 colleges/universities, most were classified as comprehensive (having undergraduate and graduate programs) schools (Figure 3).

Figure 3. Characteristics of participants' universities



Evaluation Design

Evaluation Questions

The evaluation of the webinar was both formative and summative in nature, in that the data collected from participants was intended to both gain feedback from participants about the quality of the current webinar, and also to inform future webinar events. The evaluation framework was guided by Kirkpatrick's Four Levels of Evaluation model for training and learning programs (Kirkpatrick, 1994[1]). Several questions constituted the foundation for the evaluation:

1. Did participants find the information presented in the webinar useful?
2. Did the webinar meet participants' expectations?
3. Did participants felt they learned about the central topics of the webinar?
4. Did participants feel the presenter adequately addressed audience questions?
5. Were there any technical problems with the format of the webinar?
6. What topics would participants have liked to cover if given more time?
7. What topics would participants like to cover at future webinars?

Evaluation Procedures

An electronic survey aligned to the evaluation questions was designed by the NIMBioS Evaluation Coordinator with input from Dr. Godsoe. The final instrument was hosted online via the University of Tennessee's online survey host mrInterview. Links to the survey were sent to 40 registered Webinar participants on September 9, 2010 (co-organizers were not included in the evaluation). Reminder emails were sent to non-responding participants on September 15 and 17, 2010. By September 24, 2010, 33 of the registered participants had given their feedback, for a response rate of 83%.

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Data Analysis

Data from the electronic surveys included both forced-response and supply-item questions. All data were downloaded from the online survey host into the statistical software package SPSS

[1] From Kirkpatrick, D.L. (1994). *Evaluating Training Programs: The Four Levels.* San Francisco, CA: Berrett-Koehler.

for analysis. Quantitative data were analyzed using SPSS, while qualitative data were analyzed in SPSS Text Analysis for Surveys. Qualitative responses were categorized by question and analyzed for trends.

Evaluation Findings

Respondent Expectations

In response to a question about their expectations for the webinar, the majority of respondents (64%) indicated they were hoping to learn how to use large datasets in teaching undergraduates:

> *"I had hoped the webinar would provide an example of using a large dataset in a biology classroom. I was also hoping to hear about additional sources for large datasets."*

> *"I teach ecology with lab every year to undergraduates and have an interest in introducing them to working with large datasets. It seemed like a pretty good fit with my interests, and I was hoping to learn about how to better incorporate these interests into laboratory investigations."*

> *"I was hoping to learn ways to incorporate large data sets into classroom instruction. I was hoping for examples using a variety of software platforms (e.g. R, SAS, Matlab, Excel). Also, I was hoping to find some sample data sets that instructors might use."*

A smaller number of respondents (18%) indicated they were hoping to learn how to incorporate citizen science into the classroom, while the remainder of responses was miscellaneous:

> "*Just curious about current events in science education."*

> *"[I hoped to learn] more about NIMBioS, ways to use my statistics/biology knowledge."*

> *"[I hoped to learn] what types of research and/or careers are available with a math ecology degree"*

Sixty-three percent of respondents felt as though the webinar met their expectations. Some participant comments:

> *"I'm an ecologist, so have conducted research in the field similar to those interviewed. I also required capstone course students to formulate hypotheses, conduct field research, and analyze/evaluate their data. I didn't learn much new, but I think you're on the right track for those who don't have such backgrounds."*

> *"It described a successful experience that could be replicated elsewhere."*

"Although it was not quite what I was expecting, it was still a worthwhile webinar. I got some ideas for teaching and it motivated me to continue my exploration into R as a statistical program".

"The examples used only one software platform, but I was pleased to see that it was R. Of all the options, I think R was an excellent choice because it is both free and widely used."

Many participants who said the webinar did not meet their expectations felt the example of the REU work was not applicable to use in a real undergraduate classroom:

"Although it's awesome that an REU experience like this exists, it does little to help me in a formal classroom. Yes, there are some great resources out there (R primers, for example), but it's hardly feasible to take a class of 100 on multiple field trips".

"I was hoping to learn more about ideas for the classroom. The webinar focused on a multi-month REU case study which I didn't find very transferable to a normal course."

"-- I was a little misled by the title. The undergraduates involved were a small group (4 students) from an REU program. That's a self-selected group with extremely high motivation, working informally on research. I was hoping for something that would apply more broadly, in a more formal education setting, and not just to small groups of elite research-ready students. Also, the title says "an example from a Citizen Science program." The citizen science aspect of the program seems to have been totally irrelevant to the undergraduate research project. The dataset could just as easily have been generated in some other way -- the fact that it was created in part by citizen scientists seemed to have no bearing on what they did with it."

"The case study presented was much more of a special topics course and none of the participants seemed to be ecologists or even biology undergrads. While the work they accomplished was impressive, it did not meet my expectations."

"…I'm not quite sure the examples would translate directly to the classes I teach, it gave me some general ideas to think about."

Others would have liked more details about accessing and using the database:

"Several people were wondering about the database and how to get access to it. I'm now trying to develop an R package to allow easy access to the methods used and possibly the database in the future."

"There were not enough details about the specifics of the database, the kinds of data available, other ways to use, etc."

Webinar Content and Format

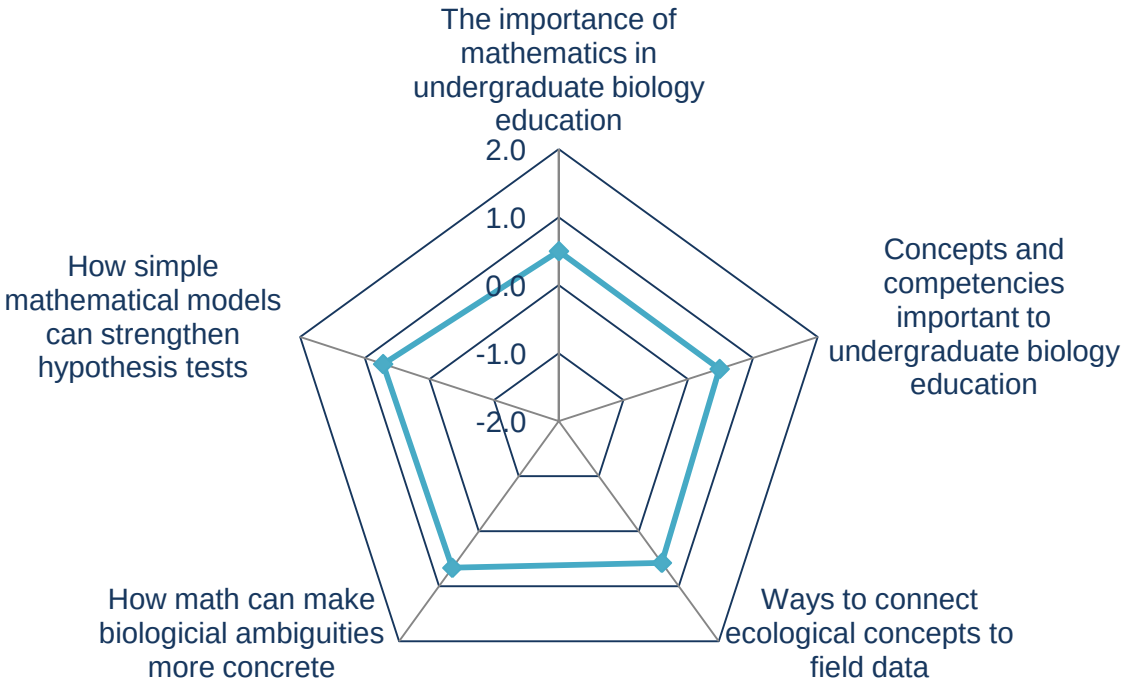
Participant Learning

The majority of respondents (52%) said they felt that participating in the webinar helped them better understand the importance of mathematics in undergraduate biology education. Respondents were asked several other questions to gauge their levels of learning about the main topics of the webinar, including learning about concepts and competencies important to undergraduate biology education, ways to connect ecological concepts to field data, how math can make biological ambiguities more concrete, and how simple mathematical models can strengthen hypothesis tests.

Respondents reported varied levels of learning about the topics, with an average of 58% of respondents agreeing that they learned more about the central topics of the webinar. While the many respondents agreed that they had a better understanding of how math can make biological ambiguities more concrete, some respondents said they either did not gain understanding, or felt "neutral" or about the amount of understanding they gained on the topics, while a small number disagreed that they learned anything about these topics (Figure 4, on a scale of 2 = Strongly agree to -2 = Strongly disagree).

Figure 4. Participant learning during the webinar

As a result of attending this webinar, participants indicated whether or not they had a better understanding of:



Several respondents who indicated they didn't feel like they learned much about the central topics indicated that they were already knowledgeable about them:

> *"I learned about a very interesting example, but I don't feel like it helped me to advance my own thinking conceptually."*

> *"I was already convinced of the importance of math in undergrad biology education, so the webinar did nothing to change that."*

> *"My negative comments do not imply that the webinar did not make those points, but it did not cover ground I have not already covered with my students."*

Another respondent said the objectives of the webinar were not clear:

> *"You might consider that except for maybe the first one, none of these points were identified as objectives in your description of the webinar. Was the webinar about undergraduate education, or was it about the importance of math in ecology?"*

Webinar Format

Ninety-seven percent of respondents indicated they felt sufficient opportunity was given for questions and comments from the audience, and that the questions from the audience were answered well. Some participant comments:

> *"Yes [the questions were answered well], though it would have been great to have had a longer presentation, or a follow-up presentation."*

> *"The moderators/presenters were very available, but the audience was quiet and didn't ask much."*

> *"The idea of promoting and facilitating this sort of training is SUPERB and highly appreciated so I do not want to sound to critical but it is recommended that the presenters practice once or twice to foresee the types of questions and resources that might be requested from the audience."*

Forty percent of respondents indicated experiencing some sort of trouble with the technology used to present the webinar. Many indicated having audio problems, while several said they had trouble loading images from the presentation. One respondent suggested having someone present to handle technical problems as they arose:

> *"…while there were moderators watching the chat, some webinars I have been on have offered further technical support or had one designated tech problem go-to person. I noticed people having trouble with the audio stepped out eventually."*

Suggestions for Future Webinars

Participants were asked what they would have like to have covered in this webinar if given more time, as well as what topics they would like to see at future webinars. Analysis of open-ended

responses indicated that a common response theme to both questions was to have more specific details and examples of how to use the information in undergraduate classes:

> *"How to convert this 8-week summer teaching experience into something that could be accomplished within a unit of a typical course (2 to 4 3-hr lab sessions)."*
>
> *"If you could start and end with more general info about math and ecology, or lessons that could be applied in the majority of cases, then that would apply to all individuals."*
>
> *"Much more discussion of how data sets can be incorporated and the kinds of ideas that can be illustrated, especially with a more "normal" class size."*
>
> *"The authors spoke about how this approach worked for students in a summer experience program. It is much harder for me to envision how you can teach your average undergraduate student in a typical undergrad class how to do these more complex analyses."*

Other suggestions for future webinar topics included information about other available datasets available for classroom use, statistics for undergrad teaching, and how to overcome differences in mathematics skills of undergrad biology students:

> *"A guide to other data sets that are available would have been nice. Also, perhaps some discussion of alternatives to using R for data analysis. The students I teach (many Wildlife and Fisheries Biology or Environmental and Natural Resources majors) tend to be quite math-phobic. The better students could certainly handle R, but I would anticipate a steep learning curve and a fair amount of resistance from a sizable fraction of the students."*
>
> *"R for undergrads."*
>
> *"Overcoming wide disparity in mathematical ability in biology undergrads."*

Conclusions and Recommendations

The majority of the webinar participants found the information presented useful and relevant, but indicated they would like more detailed information about translating the webinar's REU and ATBI examples into something they could use in their own undergraduate courses. Most participants indicated coming to the webinar with expectations of getting a "how-to" tutorial with specific information about how to use large datasets in teaching undergraduates. While participants thought the webinar provided good ideas about increasing quantitative literacy in ecology students, their comments suggested they were unsure about how to translate what was covered in the webinar into their own teaching.

Respondents reported varied levels of learning about the topics, with an average of 58% of respondents agreeing that they learned more about the central topics of the webinar. While the many respondents agreed that they had a better understanding of how math can make

biological ambiguities more concrete, some respondents said they either did not gain understanding, or felt “neutral” or about the amount of understanding they gained on the topics, while a small number disagreed that they learned anything about these topics. Several respondents who indicated they didn’t feel like they learned much about the central topics, however, indicated that they were already knowledgeable about them.

Almost half of the participants indicated experiencing some sort of trouble with the technology used to present the webinar. The most common issues were the audio not working properly, while others indicated they had trouble loading images from the presentation.

For future webinars, participants indicated they would to have more specific details and examples of how to use the information in undergraduate classes. Other suggestions for future webinar topics included information about other available datasets available for classroom use, statistics for undergrad teaching, and how to overcome differences in mathematics skills of undergrad biology students.

Based on analysis of participant response data, the recommendations are as follows:

- There is significant interest in the topic of the current webinar. Continue to offer webinars in this subject area, but consider narrowing the focus to specific ways (perhaps with examples) in which large datasets or other citizen science projects could be used in undergraduate classrooms.

- Consider providing a list of resources on the NIMBioS website for undergraduate educators interested in finding datasets to use in their classrooms.

- If using the same technology for future webinars, consider looking into the cause of the audio issues to determine where the problems lie and how to fix them.

Appendix A

List of Participants

Participants

Last name	First name	Institution
Alexiades	Vasilios	University of Tennessee Knoxville
Blonder	Barbara	Flagler College
Boyle	Sarah	Rhodes College
Bulger	David	Oral Roberts University
Downing	Amy	Ohio Wesleyan University
Evans	Nicole	Guana Tolomato Matanzas National Estuarine Research Reserve
Fink	Wendy	Association of Public and Land-grant Universities
Ghosh-Dastidar	Urmi	New York City College of Technology
*Godsoe	William	University of Tennessee Knoxville
Gram	Wendy	National Ecological Observatory Network
*Gross	Louis	University of Tennessee Knoxville
Hammond	George	University of Michigan Ann Arbor
Hook	Tomas	Purdue University
Hoopes	Martha	Mount Holyoke College
Howe	David	Rutgers University New Brunswick/Piscataway
Jackson	Kristin	University of Florida
Johnson	Alan	Clemson University
Johnson	Daniel	Indiana University Bloomington
Keller	Cherie	University of Florida
Kerkhoff	Andrew	Kenyon College
Kovach	Katherine	Duke University
Leighton	Gavin	University of Miami
Levy	Benjamin	University of Tennessee Knoxville
Litt	Andrea	Texas A&M University Kingsville
LoGiudice	Kathleen	Union College

Machado	Jose-Luis	Swarthmore College
Magori	Krisztian	University of Georgia Athens
McCartney	Melissa	American Association for the Advancement of Science
McGuinness	Barbara	United States Department of Agriculture
McLinn	Colleen	Cornell University
Miller Neilan	Rachael	Louisiana State University Baton Rouge
Momsen	Jennifer	North Dakota State University
Partlow	Christa	University of Tennessee Knoxville
Pavek	Diane	Department of Interior, National Park Service
Piechnik	Denise	Pennsylvania State University University Park
Shea	Kathleen	Saint Olaf College
Simmons	Jeffrey	Mount Saint Mary's University
Smith	Wendy	Indiana Dunes National Lakeshore
Trimboli	Shannon	Western Kentucky University
Visty	Judith	National Park Service Rocky Mountain National Park
Wilczek	Amity	Deep Springs College
Yu	Long	University of Tennessee Knoxville

*** Organizer**

Appendix B

EcoED Webinar Evaluation Survey

EcoEd Webinar Survey

"Math, Computing, Undergraduate Ecology Education and Large Datasets: An Example from a Citizen Science Program"

Thank you for taking a moment to complete this survey. Your responses will be used to improve the Webinars hosted by the National Institute for Mathematical and Biological Synthesis. Information supplied on the survey will be confidential, and results will be reported only in the aggregate.

How did you hear about this webinar?

What were you hoping to learn by attending the webinar?

Did the webinar meet your expectations?

Yes
No
Comments:

Please check the appropriate button to indicate your level of agreement with the following statements.
As a result of participating in this webinar, I have a better understanding of:
(Strongly agree, Agree, Neutral, Disagree, Strongly disagree)

The importance of mathematics in undergraduate biology education

Concepts and competencies important to undergraduate biology education

Ways to connect ecological concepts to field data

How math can make biological ambiguities more concrete

How simple mathematical models can strengthen hypothesis tests

Comments:

Did you have any problems with the technology used to present the webinar (e.g. connectivity, sound, images)?

Yes
No
Comments

Do you feel there was sufficient opportunity for questions and comments from the webinar audience?

Yes
No
Comments:

Do you feel the questions from the webinar audience were answered well?

Yes
No
Comments:

What additional information would you have liked to have covered in this webinar?

What topics would you like to see covered in future NIMBioS webinars?

NOTE: The information below was not included in this evaluation report. A separate report containing this information will be provided to the NIMBioS Director.

Are you a U.S.-based college/university faculty member?

Yes->go to next question
No->go to additional comments

NIMBioS is developing activities to enhance quantitative aspects of undergraduate life science education through curricular revision. Would you encourage your institution's administration (e.g. Department Head, Dean) to actively pursue efforts in this area?

Yes
No
Not sure

Would you wish to be personally involved at your institution in efforts to enhance the quantitative education of life sciences students?

Yes
No
Not sure

If you wish to be personally involved in these efforts at your institution, may we have your permission to contact you in the future about the activities NIMBioS is developing?

Yes
No
Comments:

Additional comments:

Appendix C

Open-ended Survey Responses

How did you hear about this webinar?

An email was forwarded to me from a colleague.

Colleagues

e-mail forward from a colleague.

Forwarded by a colleague

It was forwarded to several people (deans, chairs, grad students, faculty) before reaching me. I think the initial email was from someone at a northeast higher education consortium I hadn't heard of.

Jillian Trask sent me an email about the webinar. Jillian and I were both in the summer REU group that the webinar was partially about.

Departmental email

Dept head, Assoc dean

Ecolog

Ecolog list

Ecolog listserv

ECOLOG listserve

from the email list of the Ecological Society of America (ECOLOG_L)

I heard about the webinar through ECOLOG.

Posting to ecolog-l

Through the EcoLog listserv.

Your posting on Ecolog-L

from colleagues (through the Ecology Research as Education Network).

From emails from 3 different groups (an NSF RCN group (EREN), ESA theoretical ecology section, and a graduate group at UMass Amherst).

Information was circulated to members of the EREN network, Ecological Research As Education Network - leader Laurie Anderson

Through my National Park Service network.

ESA email announcement

E-mail

e-mail announcement

email announcement from NIMBioS.

I must have received an email

email

From the NIMBioS website.

NIMBioS

Online

website

What were you hoping to learn by attending the webinar?

I wanted to learn about incorporating citizen science into the classroom.

how to link citizen science to undergraduate studies and to academic research

Hoping to learn a new mathematical biology concept that can be used in an undergraduate classroom setting and also possibly undergraduate student research project.

How mathematics is being used in research in ecology.

How to develop and communicate questions that incorporate math and ecology

Teaching ideas

General information about students working with large ecological datasets

How to bring large datasets into the classroom to facilitate quantitative/ecological learning by undergrads

How to get undergraduates to meaningfully make use of ecological data sets

how to incorporate large data sets into the classroom for an undergraduate ecology course

how to make effective use of large data sets for teaching.

How to manage large data sets and use them for teaching purposes.

I had hoped the webinar would provide an example of using a large dataset in a biology classroom. I was also hoping to hear about additional sources for large datasets.

I teach ecology with lab every year to undergraduates and have an interest in introducing them to working with large datasets. It seemed like a pretty good fit with my interests, and I was hoping to learn about how to better incorporate these interests into laboratory investigations.

I was hoping for ideas about how to incorporate large data sets into my teaching of ecology.

I was hoping to learn ways to incorporate large data sets into classroom instruction. I was hoping for examples using a variety of software platforms (e.g. R, SAS, Matlab, Excel). Also, I was hoping to find some sample data sets that instructors might use.

ideas for using large monitoring datasets

More about how to use large data sets with class lab projects

What interested me about this seminar was your described approach of utilizing a large field data set to motivate hypothesis formulation and assessment by undergraduates.

How to access, use and apply the data in undergraduate education

Especially how the undergraduate student projects were structured, including the balance of field work and data. I felt like I left with a good understanding of that.

Explore other examples of educators using real data in science education

How I might be able to develop an educational program that would involve existing data sets at several of the ten national parks I work with.

I wanted to see an example of how students benefitted from working with a park dataset and whether the park benefitted from student work.

I was hoping to learn more about getting undergraduates involved in research, in particular ecological research involving a lot of data.

how to successfully integrate short-term field research into ecology undergraduate education

Just curious about current events in science education

more about NIMBioS, ways to use my statistics/biology knowledge

Overview of program, possible applications to future work

perspectives and reactions to the project

what types of research and/or careers are available with a math ecology degree.

applications of modeling

Did the webinar meet your expectations? (comments)

I'm an ecologist, so have conducted research in the field similar to those interviewed. I also required capstone course students to formulate hypotheses, conduct field research, and analyze/evaluate their data. I didn't learn much new, but I think you're on the right track for those who don't have such backgrounds.

It described a successful experience that could be replicated elsewhere.

No, it was a little different but not in a bad way. I found the links on the NIMBIOS site useful for the R vegan package and the R tutorials (I'm always looking for new ones for myself and students).

Although it was not quite what I was expecting, it was still a worthwhile webinar. I got some ideas for teaching and it motivated me to continue my exploration into R as a statistical program.

I think I need to learn more about the different ways data can be used before I'll actually be able to develop anything myself. It was great to see what you were doing, though.

I thought that the webinar was great, and I would be very interested in participating in future webinars. The 45 minutes went very quickly.

The examples used only one software platform, but I was pleased to see that it was R. Of all the options, I think R was an excellent choice because it is both free and widely used.

Although it's awesome that an REU experience like this exists, it does little to help me in a formal classroom. Yes, there are some great resources out there (R primers, for example), but it's hardly feasible to take a class of 100 on multiple field trips.

I was hoping to learn more about ideas for the classroom. The webinar focused on a multi-month REU case study which I didn't find very transferable to a normal course

-- I was a little misled by the title. The undergraduates involved were a small group (4 students) from an REU program. That's a self-selected group with extremely high motivation, working informally on research. I was hoping for something that would apply more broadly, in a more formal education setting, and not just to small groups of elite research-ready students. Also, the title says "an example from a Citizen Science program." The citizen science aspect of the program seems to have been totally irrelevant to the undergraduate research project. The dataset could just as easily have been generated in some other way -- the fact that it was created in part by citizen scientists seemed to have no bearing on what they did with it.

The case study presented was much more of a special topics course and none of the participants seemed to be ecologists or even biology undergrads. While the work they accomplished was impressive, it did not meet my expectations.

Yes, pretty well, although I'm not quite sure the examples would translate directly to the classes I teach, it gave me some general ideas to think about.

With the exception of using R, there was little presented that I am not already using in my teaching.

It did somewhat. I logged in early so that I wouldn't miss the beginning and also in case I had any difficulty. The website subsequently froze without my realizing it and I missed the first half of the webinar.

The audio was actually kind of hard to hear. I could barely hear with my internal laptop speakers up all the way, and had to go get headphones. Otherwise, the user interface of the webinar software was very nice! The content was good too - it seemed organized, kept interest, lasted an appropriate time.

Although they showed one example of how data sets could be brought into the classroom, I don't feel like the topic was explored very much. I was left wanting more, much more.

Several people were wondering about the database and how to get access to it. I'm now trying to develop an R package to allow easy access to the methods used and possibly the database in the future.

There were not enough details about the specifics of the database, the kinds of data available, other ways to use, etc

In general, I enjoyed the webinar, but I thought it was going to be more about a class-based activity, rather than a summer REU.

I expected it to be a case study, and that is what it was. I would like to see more generalizable models

I wish you had a "sort of" or "may be" button instead of yes or no. I liked the approach of the study, however the delivery was sometime scattered which made it hard to follow at times. It would be nice to have a pdf of the webinar.

Comments about what was learned:

I really liked that the presenters used examples that they had given or used with their students. I was struck by how simple the examples were, but how they illustrated the concepts so well.

I learned about a very interesting example, but I don't feel like it helped me to advance my own thinking conceptually.

I was already convinced of the importance of math in undergrad biology education, so the webinar did

nothing to change that.

My negative comments do not imply that the webinar did not make those points, but it did not cover ground I have not already covered with my students.

I would like to see how the real data are used in mathematical analysis. If it is a small data set; its okay. However, likes to see how real data are stored (is it stored in a matrix form?} and then how it is used.

You might consider that except for maybe the first one, none of these points were identified as objectives in your description of the webinar. Was the webinar about undergraduate education, or was it about the importance of math in ecology?

Did you have any problems with the technology used to present the webinar (e.g. connectivity, sound, images)? (Comments)

As I mentioned, it was hard to hear. Otherwise, the interface was great (better than most webinar software).

Audio problems on multiple computers with Ubuntu. The audio was being played at an abnormally fast rate.

Could barely get any sound, even with the sound on the site and on my computer all the way up. I finally gave up.

Every once in a while the voice of the speaker would cut out for roughly 5 seconds or so.

In Safari, I couldn't get sound despite running the set ahead of time. When I reopened in Firefox, sound was fine.

no sound

Sound was very poor.

The sound periodically paused for 3-5 seconds and then continued. No information was lost, it was just delayed.

The sound was cutting in and out throughout most of the webinar, though I think it cut out less frequently during the second half.

There was a slight echo with a pause occasionally, but it wasn't bad.

Windows 7 issues had to be worked out.

Everything worked well.

worked great

I didn't know how to access the PowerPoint presentation, but maybe that was static.

I logged in early in case I had problems. While waiting for the webinar to begin the website stopped updating without my realizing it and I missed half the webinar. I then could not log back in because it thought I already was. I had to log in with a different email address.

Images didn't always appear or appeared so slowly that talk had moved on.

Do you feel there was sufficient opportunity for questions and comments from the webinar audience? (Comments)

It probably could have been scheduled for a full hour or more. Also, while there were moderators watching the chat, some webinars I have been on have offered further technical support or had one designated tech problem go-to person. I noticed people having trouble with the audio stepped out eventually.

Yes, though it would have been great to have had a longer presentation, or a follow-up presentation.

I just didn't have any questions based on the little information that was presented.

The moderators/presenters were very available, but the audience was quiet and didn't ask much.

Not sure...The webinar went longer than the advertised 45min and I had to leave after 45min

Do you feel the questions from the webinar audience were answered well?

I cannot think of an improvement. I thought they did a wonderful job.

I'm neutral on this.

not sure

The idea of promoting and facilitating this sort of training is SUPERB and highly appreciated so I do not want to sound to critical but it is recommended that the presenters practice once or twice to foresee the types of questions and resources that might be requested from the audience.

What additional information would you have liked to have covered in this webinar?

If possible, it would be beneficial to see any reports, papers, or posters generated from the REU students' data analysis.

A guide to other data sets that are available would have been nice. Also, perhaps some discussion of alternatives to using R for data analysis. The students I teach (many Wildlife and Fisheries Biology or Environmental and Natural Resources majors) tend to be quite math-phobic. The better students could certainly handle R, but I would anticipate a steep learning curve and a fair amount of resistance from a sizable fraction of the students.

I didn't ask this question so it's my own fault but I wondered if anyone had speculated on why ATBI dataset differed from Whittaker dataset in where insects were found.

I think I would benefit from a really detailed look at exactly what specific individual steps you took to do this, but this was possibly not the right format to do this.

Storing of real data and how it is applied with mathematical settings.

At times the seminar delivery did not wed the initial principles presented to their examples.

I think the webinar covered a good range of topics pretty thoroughly in the time given.

an exercise that could be done in a three hour lab

How to convert this 8-week summer teaching experience into something that could be accomplished within a unit of a typical course (2 to 4 3-hr lab sessions).

If you could start and end with more general info about math and ecology, or lessons that could be applied in the majority of cases, then that would apply to all individuals.

More examples of how to start off getting undergraduates involved with similar projects.

More ideas for how to bring similar approach into a classroom course

Much more discussion of how data sets can be incorporated and the kinds of ideas that can be illustrated, especially with a more "normal" class size.

Much more on educational considerations.

The authors spoke about how this approach worked for students in a summer experience program. It is much harder for me to envision how you can teach your average undergraduate student in a typical undergrad class how to do these more complex analyses.

This webinar focused on projects conducted by a small number of math-competent students. I generally find myself working with a large number of students with a huge range of abilities. Tips for handling that spread would be useful.

How to incorporate math into ecology labs better.

I am not sure. I guess I was more interested in hearing about the citizen science aspect of the project, or how to implement such projects in a typical class rather than an intensive research experience

What topics would you like to see covered in future NIMBioS webinars?

anything that connects research in natural resources with education

How to incorporate computer modeling into Biology courses (including choosing software that is affordable and user-friendly).

I am looking for specific ways to incorporate the use of public datasets in the classroom/ lab to illustrate ecological principles or concepts.

I would definitely be interested in hearing more about quantitative activities in ecology lab classes - including field work, modeling from existing data sets, or simulation exercises.

more uses in classes, labs

Evolution and Mathematics

Broader Impacts

Parameter Estimation and Optimization in mathematical biology.

R for undergrads

Statistics, modeling, GIS, opportunities/examples from small institutions

This is my first one - I enjoyed it. I don't know much about NIMBioS and what the mission is.

Overcoming wide disparity in mathematical ability in biology undergrads.

Additional comments:

It was wonderful. Hoping to hearing from you soon.

please check sound issue- I would be happy to attend in the future if this issue can be resolved

Thank you and keep them coming.

Thank you, I thought the webinar was excellent.

Thanks for making this available!

Thanks for your hard work. I read somewhere that in order to bring mathematics to the biology curriculum teachers will need to be taught some mathematics. It would be ideal if you could help us retrain ourselves one example at a time so that we can help you fulfill the purpose of your program.

Would you be willing to share a pdf of this NIMBioS webinar with all participants? Thank you!