Using an online, real-time database of environmental variables to teach about scale and dynamics in ecology

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The Global Lake Ecological Observatory Network and its public online database can be visited at www.GLEON.org

The instructional materials address two observed teaching challenges:

**Problem 1.** Students have difficulty recognizing that ecosystems are dynamic.

**Problem 2.** Students often assume the scientific process is linear and non-malleable (i.e., one way to "do" science: hypothesis-experiment-results)

The spiral shape and spurred arrow in this diagram show how the non-linear, iterative nature of scientific inquiry are incorporated into these instructional materials.

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Problem

- Effective collaborations between scientists and teachers are considered to be valuable for increasing scientific literacy, improving understanding of the nature of science (NOS) and improving elementary through high school science curricula.

- Kim (2007) found that science educators felt under-prepared to teach the process of science effectively, while scientists were generally unknowledgeable about education practices or pedagogy.

- Educators are often asked to engage as learners with instructional materials (IM) to teach them to how to approach the materials to benefit their students, or to gain a better understanding of a topic before presenting it in their own classrooms.

- There is less information available regarding teacher engagement as both learners of the content and collaborators with scientists during IM development.
Research Questions

1. What are teacher attitudes about engagement as both a learner and a collaborator in the development of high school science IM?

2. How effective is the IM prototype at relaying content knowledge to the teachers (learners)?

3. What is the potential for classroom application of the IM prototype for the teachers (collaborators)?
Approach

We hosted two high school science educator workshops

During these workshops, we asked the educators to:

• engage with an IM prototype as *learners*
• provide their constructive criticism as *collaborators*

Experienced high school educators
88% > 5 yrs teaching

Broad disciplines taught
landscape ecology to general chemistry

Motivated
attend a Saturday professional development

www.limnology.wisc.edu  # participants
Assessment

Collected artifacts

- Background Knowledge Probe
- Concept maps
- Frayer models
- What I know/Need to Know charts
- Written reflection of how the IM contributed to learning

Questionnaire 1 (prior to wkshp)

Attitudes about:
- Engaging as a learner with IM
- Development or adaptation of IM
- Engaging as a collaborator with scientists

Questionnaire 2 (end of wkshp)

Attitudes about:
- Enjoyment of the workshop
- Mastery of learning outcomes
- Anticipated student mastery
- Accomplishment of the workshop goals
- Their perceived value as a collaborator
- Anticipated use/modification of IM in their classroom
- Mastery of learning outcomes
Overview of Results

As a learner, the module was enjoyable to participate in.

A typical student in my class would enjoy this learning module.

As a result of this workshop, I am likely to collaborate with outside groups to address teaching challenges.

In what setting are you most likely to use a learning module like this in your classroom?

Based on the graphs below, which lake is more productive?

A: (5)
B: (1)
Both are equally productive (0)

Use

Content
Big Take Home Messages

Experienced educators are less interested in using the IM prototype as a package. They would rather have a piece meal or tool box from which they can chose components for their own lessons.

Though educators self-report value on engaging as learners with IM, observational data suggests that they were less comfortable with this aspect of the workshop. Future work should attempt to reconcile this contradiction with rigorous assessment.
Educator suggestions for IM (collaborators)

Enhancing learning communities: Wiki site established for ongoing communication and repository of IM components

Relevant podcast in addition to newspaper background reading on eutrophication

Video of young researchers in action: GLEON buoy deployment

Resources for purchasing sensors to provide a concrete experience

Making Waves is a bi-weekly audio podcast reporting on the latest National Ocean Service news and information.
Journey

Teaching As Research

Fosters

Learning Through Diversity

Support

Learning Communities

Support
Looking forward

My internship has informed my view of teaching and learning as it relates to my future teaching. Most importantly, I have learned that I have much more to learn, reaffirming the philosophy of iterative teaching and learning. Particularly, I recognize there are things I miss or don’t consider, mistakes I make, preconceptions I hold, and experiences that I lack that others have.

As a teacher, I am a learner.

I am continually learning how to teach.

I believe that this experience has made me more self-aware in my teaching, iterative in the teaching-learning process, and purposeful in seeking out dialogue and constructive criticism from other “teacher-learners”.