



MOTIVATING STUDENTS IN LARGE CLASSES

Putting research on learning
to practical use

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Challenges: Motivation

Quotes from the pre-workshop survey:

- I would like to be able to inspire students, so that they want to learn not just because it's required for class, but because it's interesting to them personally and relevant.
- Overcoming perceived barriers to doing something "different" with lectures in large classes.
- Motivating the struggling students to try harder by making better use of available resources.
- Getting students to do class work, outside of class.

Research-based Keys to Success

Motivating students to learn*

- Choose topics that are relevant to students & make the relevance explicit
- Make it challenging, but provide scaffolding for those who need it
- Provide choices: give students some voice in course content or assignments
- Help struggling students to strategize
- Foster a sense of belonging: be welcoming, helpful, organized, & encouraging
- Be supportive: listen, offer hints and encouragement, respond positively to student questions
- Provide role models

* Recommendations from <http://serc.carleton.edu/NAGTWorkshops/affective/motivation.html> (and references therein)

Motivating Students to Learn

You might be thinking: “That’s not my job.”

But wouldn’t you rather teach a room full of motivated students than a room full of unmotivated students?

Good news! There are some very simple things you can do to motivate students.

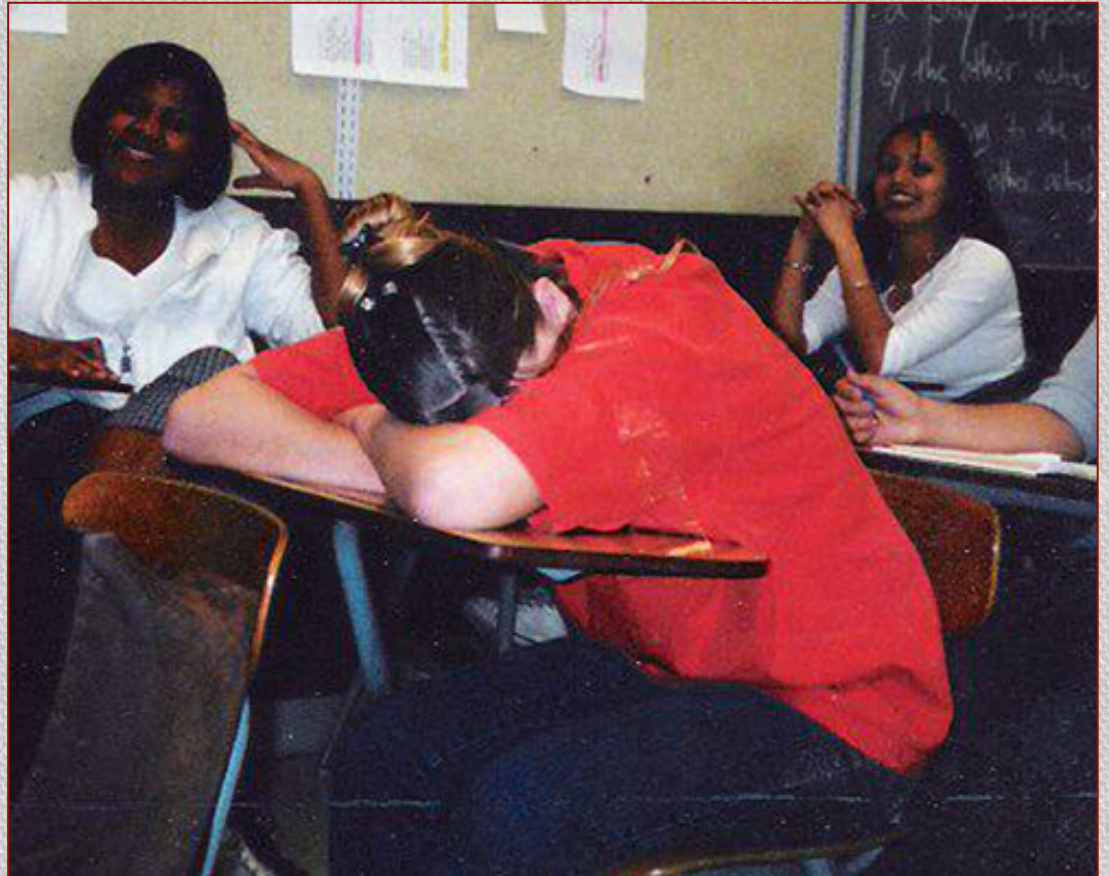


Photo courtesy of John Bohlman

Motivating Students to Learn

- Make it relevant: connect course material to student lives (Brozo, 2005)

The Lifestyle Project

serc.carleton.edu/introgeo/enviroprojects/lifestyle.html

Starting Point Teaching Entry Level Geoscience

Search the Site Go

Starting Point-Teaching Entry Level Geoscience > Experience-Based Environmental Projects > The Lifestyle Project

Explore Teaching Examples | Provide Feedback

Starting Point-Teaching Entry Level Geoscience

- Assessment
- Campus-Based Learning
- ConceptTests
- Conceptual Models
- Cooperative Learning
- Earth History Approach
- Experience-Based Environmental Projects**
- What is experience-based learning?
- Why use experience-based projects?
- How to use experience-based environmental projects
- Examples of experience-based environmental projects
- The Lifestyle Project**
- The Lifestyle Project Description
- Lifestyle Project Journals and Assessment
- Teaching Notes for the Lifestyle Project
- Eco-Quiz
- The Lifestyle Project at the University of Redlands
- The Lifestyle Project at West Chester University of

The Lifestyle Project

Karin Kirk, Montana State University/SERC and John J. Thomas, Skidmore College

► This activity has been reviewed by 2 review processes

This material is replicated on a number of sites as part of the [SERC Pedagogic Service Project](#)

Summary


This three-week project challenges students to learn about environmental alternatives by modifying their own lifestyles. Throughout the project, students reduce their impacts on the environment by changing the way in which they live from day to day.

Learning Goals

Learning goals include the following:

- Which everyday tasks require large inputs of energy
- Which everyday tasks do not require a lot of energy
- Simple ways to reduce energy use
- The details of what can and cannot be recycled in their community
- Simple ways to reduce garbage output
- Simple ways to reduce water consumption
- The connection between food production and energy use

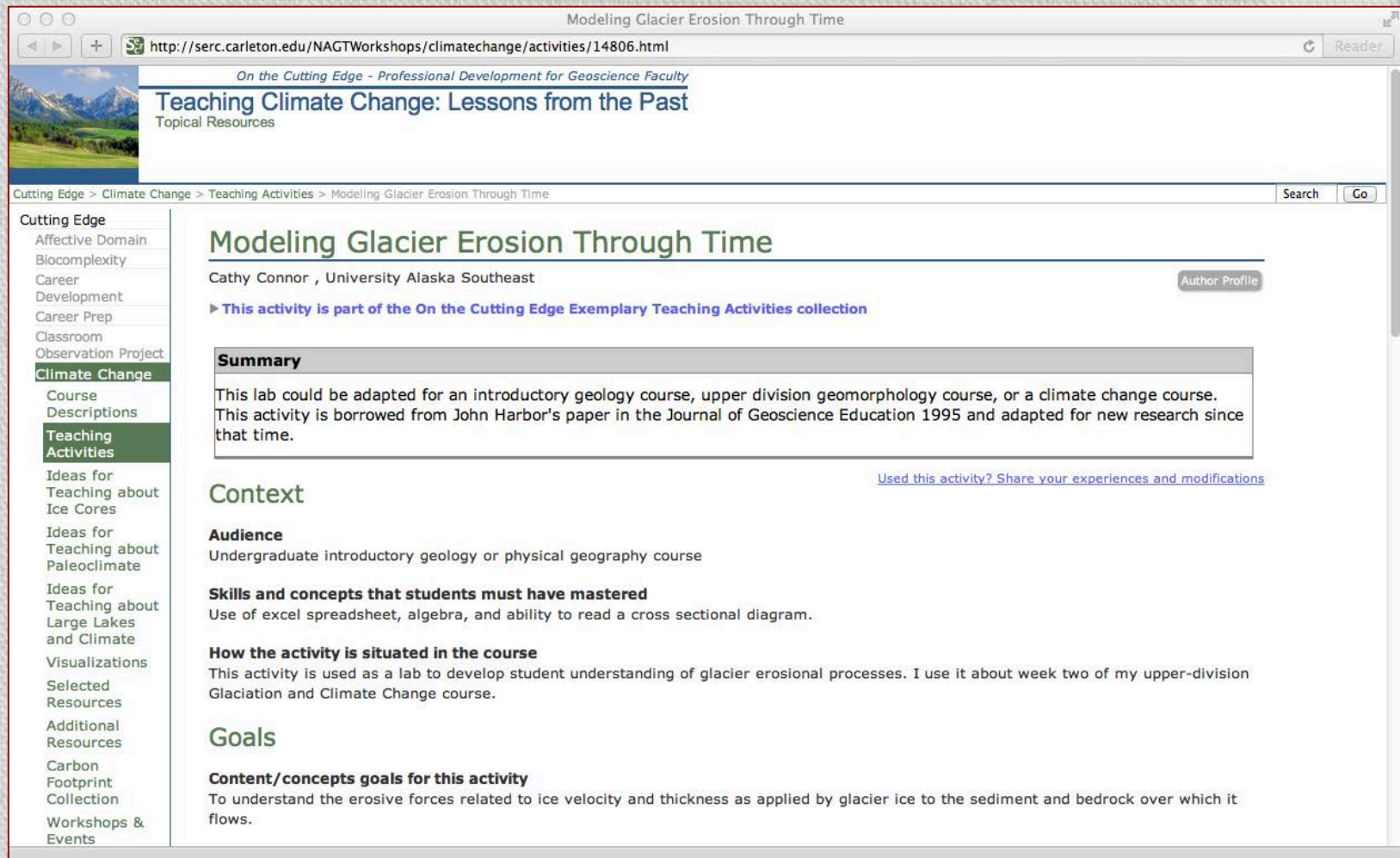
In addition to the learning goals listed above, students will come to understand that they do indeed play a role in the big picture. While it is easy to blame others for environmental problems, students will realize that they are both part of the problem and part of the solution. Students will also learn that making small changes to their lifestyles is not difficult and they can easily reduce their personal impact on the environment.



Jefferson County landfill, Colorado. Photo by David Parsons

Motivating Students to Learn

- Challenge students, but scaffold their efforts (Wang and Han, 2001; Margolis and McCabe, 2006; Adams, 1998)



The screenshot shows a web browser window with the address bar displaying <http://serc.carleton.edu/NAGTWorkshops/climatechange/activities/14806.html>. The page title is "Modeling Glacier Erosion Through Time". The main heading is "Teaching Climate Change: Lessons from the Past" with the subtitle "Topical Resources". A navigation breadcrumb trail reads "Cutting Edge > Climate Change > Teaching Activities > Modeling Glacier Erosion Through Time". A search bar is located in the top right corner.

Cutting Edge

- Affective Domain
- Biocomplexity
- Career
- Development
- Career Prep
- Classroom
- Observation Project
- Climate Change**
- Course Descriptions
- Teaching Activities**
- Ideas for Teaching about Ice Cores
- Ideas for Teaching about Paleoclimate
- Ideas for Teaching about Large Lakes and Climate
- Visualizations
- Selected Resources
- Additional Resources
- Carbon Footprint Collection
- Workshops & Events

Modeling Glacier Erosion Through Time

Cathy Connor, University Alaska Southeast [Author Profile](#)

► This activity is part of the [On the Cutting Edge Exemplary Teaching Activities collection](#)

Summary

This lab could be adapted for an introductory geology course, upper division geomorphology course, or a climate change course. This activity is borrowed from John Harbor's paper in the Journal of Geoscience Education 1995 and adapted for new research since that time.

[Used this activity? Share your experiences and modifications](#)

Context

Audience
Undergraduate introductory geology or physical geography course

Skills and concepts that students must have mastered
Use of excel spreadsheet, algebra, and ability to read a cross sectional diagram.

How the activity is situated in the course
This activity is used as a lab to develop student understanding of glacier erosional processes. I use it about week two of my upper-division Glaciation and Climate Change course.

Goals

Content/concepts goals for this activity
To understand the erosive forces related to ice velocity and thickness as applied by glacier ice to the sediment and bedrock over which it flows.

Motivating Students to Learn

- Provide choices: allow students some voice in course content or assignments (Kurvink, 1993)

The screenshot shows a web browser window with the URL serc.carleton.edu/dev/introgeo/firstday/activities/21675.html. The page header features the 'Starting Point Teaching Entry Level Geoscience' logo and a search bar. The main content area is titled 'What Students Want to Learn' and includes a navigation breadcrumb: 'Starting Point-Teaching Entry Level Geoscience > First Day of Class > First Day of Class Activity Examples > What Students Want to Learn'. A sidebar on the left lists various resources, with 'First Day of Class' and 'First Day of Class Activity Examples' highlighted. The main text area contains the following content:

What Students Want to Learn

On the Cutting Edge This material was originally created for [On the Cutting Edge: Professional Development for Geoscience Faculty](#) and is replicated here as part of the [SERC Pedagogic Service](#). [Author Profile](#)

Course: Earth Resources
60 students

Surveying your students about what they want to learn in a course can tell you a lot about them and their interests, and how to connect your learning goals to their interests. It can also help get them invested in the course, provided you make an effort to address their interests.

The Activity

Following the viewing of the video "Geology: Why Bother," I hand out index cards and ask each student to write down

- their name (including nickname)
- hometown (used to divide groups geographically into small sub-groups for a later out-of-class project assignment)
- major (used to create diverse small subgroups to work on out-of-class project assignment), and
- one or two things about earth resources that they would like to see covered during the semester.

I group these items into common themes and incorporate the topics into a day-by-day course outline which I then hand out the second day of class. In this way, I hope to create a sense of ownership in the course on the part of the students - in that we would be emphasizing topics that they had selected. The course is the second semester of the required geology sequence for non-majors and anything that can get students to invest part of themselves into this course helps generate class discussion and interest.

Motivating Students to Learn

- Help struggling students to strategize (Tuckerman, 2003; Margolis and McCabe, 2006)
- Consider teaching them metacognitive skills, so they regulate their learning

The screenshot shows a web browser window with the address bar displaying `serc.carleton.edu/NAGTWorkshops/metacognition/largeclasses.html`. The page title is "The Role of Metacognition in Teaching Geoscience" under the heading "On the Cutting Edge - Professional Development for Geoscience Faculty". The main content area is titled "Teaching Metacognition in Large Classes" by Perry Samson, from the Department of Atmospheric, Oceanic and Space Sciences, University of Michigan. The text describes a lecture on particle distribution and includes a diagram and a graph. The diagram shows the process from "Hot Vapor" to "Primary Particles" via "Condensation", and then to "Chain Aggregates" via "Coagulation". The graph plots "Particle Diameter (μm)" on a logarithmic scale from 0.001 to 100, showing three distinct peaks. A yellow callout box on the right contains a quote: "Many students arrive in our classes with good study habits and a desire to learn. They have, at some point, constructed strategies for adapting their learning to new situations and disciplines. But other students, and particularly in the survey courses required of non-science majors, bring to class a preconceived view that science 'doesn't come easily' to them and this can interfere with their motivation to learn."

Teaching Metacognition in Large Classes

By Perry Samson
Department of Atmospheric, Oceanic and Space Sciences, University of Michigan

I remember once finishing a lecture on the why particles are distributed in three modes in the atmosphere. I used an image, brilliantly developed years earlier by [Prof. Kenneth Whitby](#) of the University of Minnesota showing a plot of the tri-modal distribution of particle number versus particle size (Figure 1) as I felt it embodied the essence of what I was trying to convey that hour. I was pleased with my lecture, detailed yet full of examples and relevant examples working to describe how physical processes in the atmosphere would be expected to produce three distinct sizes of particles. The graph had served to end the lecture with the scientific major chord that would have made Beethoven proud.

I stood and turned to the class and asked for questions. There was a long silence, which I assumed to be a time of reflection, with the students absorbing the lesson and constructing their own understanding. Then, just before time was up a fellow in the front row raised his hand and asked "I see the three mountains in the picture, but I don't understand which way the wind is blowing."

The essence of why I teach metacognition is embodied in that student's response. Students often think they understand what is being taught but it is not uncommon that they are wrong. When students engage in metacognition, they (1) come to an understanding of what they understand and (2)

Hot Vapor
↓
Condensation
↓
Primary Particles
↓
Coagulation
↓
Chain Aggregates

Coagulation

Particle Diameter (μm)

0.001 0.01 0.1 1.0 10 100

"Many students arrive in our classes with good study habits and a desire to learn. They have, at some point, constructed strategies for adapting their learning to new situations and disciplines. But other students, and particularly in the survey courses required of non-science majors, bring to class a preconceived view that science 'doesn't come easily' to them and this can interfere with their motivation to learn."

Motivating Students to Learn

- Foster a sense of belonging: be welcoming, helpful, organized, and encouraging (Freeman, Anderman and Jensen, 2007; Anderman and Leake, 2005)
- Be supportive: listen, give hints and encouragement, be empathetic, respond positively to student questions (Reeve and Hyungshim, 2006)



Image from Microsoft clip art.

This teacher is showing “immediacy behaviors” that promote learning. She is smiling, is showing comfortable body language and is interacting with her students.

Motivating Students to Learn

- Provide role models, including peers: show examples of a broad range of geoscientists and geoscience students (Wiens et al., 2003; Margolis and McCabe, 2006)



Image from <http://serc.carleton.edu/NAGTWorkshops/earlycareer2012/program.html>

Motivating Students to Learn

Take a few moments to think about your course(s)....

- What's one topic you include where the relevance to students' lives is clear to you, but may not be obvious to them?
- What's one thing they find challenging, where you might provide scaffolding to help?
- Is there a topic you teach about where you could include a role model: a story of someone you know who studies that topic, who resembles some of your students (and maybe doesn't resemble you)?

Resources

Teaching large classes:

- http://serc.carleton.edu/teachearth/site_guides/largeclass.html
- http://serc.carleton.edu/NAGTWorkshops/intro/large_classes.html
- <http://serc.carleton.edu/NAGTWorkshops/earlycareer/teaching/LargeClasses.html>

Motivating students:

- <http://serc.carleton.edu/NAGTWorkshops/intro/motivation.html>
- <http://serc.carleton.edu/NAGTWorkshops/metacognition/largeclasses.html>

Engaging students in learning:

- <http://serc.carleton.edu/sp/library/interactive/index.html>
- <http://serc.carleton.edu/sp/library/cooperative/index.html>
- And many more, here: <http://serc.carleton.edu/sp/library/pedagogies.html>

Assessment in large classes:

- <http://serc.carleton.edu/NAGTWorkshops/assess/lgclass.html>

References

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