Teaching and Learning Portfolio

by

Paul Riley

January 2009

Learning

Research

Teaching

NSF

DELTA

Integrating Research, Teaching, and Learning

C I R T L

Delta Disclosure

The Delta Program in Research, Teaching, and Learning is a project of the Center of the Integration of Research, Teaching, and Learning (CIRTL—Grant No. 0227592). CIRTL is a National Science Foundation sponsored initiative committed to developing and supporting a learning community of STEM faculty, post-docs, graduate students, and staff who are dedicated to implementing and advancing effective teaching practices for diverse student audiences. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

For more information, please call us at 608-261-1180 or visit http://www.delta.wisc.edu.

Table of Contents

I. Teaching and Learning Philosophy

My first memorable experience of teaching was in a non-traditional setting. After my senior year of high school, I was employed by a Christmas tree trimming service in Pennsylvania. There are, literally, millions of Christmas trees to trim; thus, the company employed ~30 Americans and ~40 migrant workers. Midway through the summer, one group of migrant workers left, and a new group arrived. Every American was paired up with a migrant worker, to teach the migrant workers how to trim the trees properly. I did not speak much Spanish, and my counterpart did not speak English. Verbal communication was limited, so we resorted to using hand motions and visual aids for communication. Based on the situation both the teacher and learner morphed their methods of communication to accomplish the goal. From this experience, I realized that: 1) I enjoy finding alternative ways of expressing a concept; and 2) I found myself reflecting on the event, thinking of ways to facilitate learning and how things could have gone more smoothly.

The tree trimming story illustrates the manifestation of teaching as a dynamic process that establishes learning as a **two-way street**, which can be done through one of the pillars of the Delta program: Learning Communities. The responsibility of learning should be shared by **both** the student **and** the teacher. The student must put forth effort to learn the material; the teacher must identify ways to maximize class learning. This philosophy directly facilitates learning through a positive feedback reaction. An initial effort should be made to show the students I care not just about course content but also about actual learning/retention through a variety of methods (e.g., reflective statements, extracurricular support, discussions, etc.). This initial effort causes students to notice I care about them as learners, and in turn they respond more enthusiastically to the topic at hand. More student enthusiasm causes me to want to better their learning process, starting the feedback reaction. Thus, I always attempt to have continual enthusiasm for the subject I am teaching, which also enhances the likelihood of active participation.

I believe that university classes are too often trapped into a certain style of class, usually straight lecturing. As the teacher, I bear the onus of gathering information on a class's learning styles early in the semester, and actively morph the class according to the class needs. I believe that this does not mean turning the class on-end, but rather modifying existing exercises to the class needs. In a geology class, this means I may ask a question through a word problem one year, a 3-D block diagram the next year, a series of hand samples in another year, or using some convolution of the methods another year. Again, I do not believe this means to completely become engrossed in one teaching style (e.g., kinesthetic, visual, etc.), but rather to be inclusive of learning styles that may be not have been present the prior year. However, unless information on learning styles is gathered for each class, it is not known if the class needs to be adapted. It is the instructor's job to identify the diversity exhibited in each class, in order to make sure the teaching style is not detracting from the learning experience. This represents one aspect of the Delta pillar of Learning through Diversity, the concept that class learning experiences are enriched through inclusion of diverse backgrounds.

In order to maximize learning, I believe teaching should be viewed as a **dynamic process**, in which assessment is used to guide the course through the semester and for future semesters. I attempt to conduct a continual examination of what is and isn't working in my teaching, using assessment as feedback for guiding course changes (i.e., collect data, interpret the data, change instruction according to the interpretation). Approaching teaching in this manner hits on the Delta pillar of Teaching as Research, where we approach teaching in the same manner as we would research. Thus, teaching must become a reflective activity. Teachers collect background information, develop alternative methodologies, assess their learners (e.g., tests, quizzes, etc.), and guide future teaching based on results. Viewing teaching as a dynamic process, through incorporation of teaching-assessments and using a teaching-as-research approach, demonstrates to the students a willingness of the teacher to adapt to the class to best serve its needs.

I believe that incorporating teaching assessment throughout a semester is a vital tool for maximizing learning. Through teaching assessment, a teacher can evaluate the best teaching methods for a given class. This methodology may be through extracurricular learning experiences, the creation of hands-on labs, or even through critical thinking writing exercises. Whatever the method employed, it should be based on improving class learning; as researchers we adapt the methods to fit the problem to be solved, why not morph our teaching to fit the class dynamic?

My objective as a teacher is to provide the best environment for learning, based on the needs of the learners. However, there is often a disconnect between teachers and learners in the classroom; I believe **developing learning communities** helps bridge this disconnect. Learning communities, where individuals meet outside the classroom to further their understanding about a subject, offer a more collaborative, relaxed atmosphere than classrooms. I believe learning communities directly facilitate comprehension, and can be utilized not only for learners, but also for teachers. Teachers can use learning communities to gather information from colleagues, and to reflect upon what is and is not going well in their teaching.

Based on this philosophy, I intend to teach courses through a combination of lecture, hands-on activities, and discussion. Geology courses arguably offer the best opportunity for students to be engaged in hands-on learning; rocks are everywhere, and if we (the teachers) can incorporate our surroundings more into the classroom, we can more effectively reach the students. In Fall 2006, I spent a semester as Temporary Faculty at Central Michigan University; while there I led a field trip to the Upper Peninsula, MI. I participated in many field trips as a student, but this was my first experience leading a trip. The students had been taught skills and knowledge in the classroom, but on the field trip, you could tell things 'clicked' for the students. It was a very rewarding experience, from a teaching standpoint, and strengthened my belief that outside of the classroom experiences are necessary for development.

As I have attempted to demonstrate in my teaching philosophy, I believe that continual enthusiasm facilitates learner involvement, that teaching should be viewed as a dynamic process through teaching as research, that diverse learning styles should be addressed and allowed to flourish, and that the development of learning communities is a fundamental way to improving learning.

II. Introduction-Why I started thinking about teaching and my teaching background

Throughout my academic career, I have had the good fortune of having opportunities to develop my teaching background. As mentioned in my teaching philosophy, my first (albeit informal) experience teaching was through a summer job working on a Christmas tree farm. After that summer, I progressed to my freshman year at Franklin and Marshall College (F&M). My first semester, I took a geology course, and quickly decided that was the right major for me. After taking several geology courses my freshman and sophomore years, I had my first opportunity as a Teaching Assistant (TA) for the 100-level course Earth, Environment, and Humanity in the fall of my junior year. My role as a teacher was limited, mostly setting up labs and answering questions in lab, but I found I greatly enjoyed interacting, and helping students progress in their studies.

After this experience, I expressed my interest in continuing to be a TA, and was offered the TA position for Sedimentology, an upper-level course. I had a much more interactive role in this course. The labs were longer, often requiring multiple hours of work outside the designated time when the instructor could not be available, so I was able to work with the students much more. I again found this to be a rewarding experience, and enjoyed the challenge of helping at a more advanced level. Then, in the fall of my senior year, I became a preceptor for the intro-level course I had taught the year before.

I grew up in a very academic household; my father is a math/computer science professor, and my mother is an instructor for entry-level college math courses. Despite the heavy influence this had on my personal interest in math/science, I thought very little about teaching, or the teaching process. My first experience thinking about teaching-as-research came as the 'Preceptor' for "Earth, Environment, and Humanity." The preceptor position consisted of being a teaching assistant for the class, and in addition, taking a course with other preceptors on philosophies on teaching. We came from a variety of fields (science, government, arts, etc.) but shared the common interest of wanting to discuss teaching, and how others went about teaching.

The instructor for the teaching philosophy course was the provost, and he held the course at his house (off campus). We had weekly article readings, and would meet to discuss those readings, as well as what was working for our teaching. The articles provided pedagogical background; we read material ranging from Plato to teaching with technology. Thus, the preceptor opportunity effectively allowed us to learn (through the readings) and reflect (through the discussion). Through this, we constructed a valuable learning community taught me good teaching involves a constant examination of what is, or isn't working, and how one can best reach the students. Through this experience, the concept that a teacher should reflect about the teaching process was formulated in my mind.

After I graduated from F&M, I progressed to graduate school at the University of Wisconsin-Madison, which is my present position. Although F&M exposed me to teaching, especially on the liberal arts level, the UW-Madison has allowed me to actually develop as a teacher. I have now been the TA, which is a much more involved position here than at F&M, for 5 different courses, including online courses, field-mapping courses, and an advanced structural geology course. In addition, I had the opportunity to spend a semester as temporary faculty at Central Michigan University, where I taught intro-level geology, field methods, and structural geology (my research area). Most recently, for the last 2 academic years, I have been the Head Teaching Assistant for the Geology & Geophysics, which has allowed me to observe how teaching is approached in the department, and how we as TAs can better our teaching.

In addition to my teaching experiences during graduate school, the UW-Madison has also offered teaching professional development. This began with my participation in a Delta course my first year of graduate school, designing the labs used in an Integrated Liberal Studies course (Ways of Knowing in Science). Based on this experience, I decided to become more involved in the Delta program, next participating in a Delta Internship, which is later detailed in my second artifact and reflection. In addition, I took the course "International Students, International Faculty" to broaden my concepts on diversity, and the Expeditions in Learning seminar, where we looked at alternative settings for learning. Currently, I am enrolled in the Delta graduate seminar "Teaching Large Classes".

I have also participated in the Delta program outside the classroom. Most recently, I have participated on the Delta Steering Committee, and sat in on a listening session designed to get feedback on how to provide teaching professional development to graduate students. Indirectly, the Delta program has also allowed me to be a TA evaluator for the College of Engineering, as well as being involved in new TA training.

This Teaching and Learning Portfolio is meant as a summary of my reflections on teaching through my academic career. The artifacts contained within were chosen to represent key points along my journey, and are not comprehensive of my entire teaching experiences. My intent is that through this portfolio exemplifies some idea of what I believe goes into teaching, and how the process of teaching should be viewed.

III. Philosophy in Practice

A. Assessment as a two-way street

Artifact

1)

A) Mid-semester evaluation from Intro-Geology class.

What are some specific things your instructor does **that help you learn** in this course?

- Writing the notes as he goes.
- Always answering questions.

What are some specific things your instructor does **that hinder or interfere with your learning?**

- he tended to wonder off topic a bit.

Please give your instructor **some practical suggestions on ways to improve your learning** in this course.

- try to incorporate more connections between topics.

B) Mid-semester evaluation from Field Methods class.

1) What did you like/dislike about this class and teacher?

The class was interesting - hands on learning. The teacher new the material and made the class fun.

2) What suggestions do you have for improving this class?

I liked the class the way it was but might organize the Republic trip. Maybe lecture about Republic History ~~[illegible]~~ before we get up there to have an idea of what we're looking for.

2)

TA EVALUATION FORM

TA: ______________________

Section: Mon, 9:55 AM.

Preparation/Organization:

- On time, there @ least 5 min. before start of class
- Began by talking about Midterm
- was ready to hand out quiz as class started
- Seems well organized

Presentation/Lecture Style:

- TA sat at back of class
- Gave 1 min. warning for quiz, ending.
- Don't bring laptops?
- Went over quiz right after collection
- Group activity
  - ↳ Pictionary → was this idea?

Student Interaction:

- limited interaction before class
- Sitting down → limits interaction
- Students seem 'shy' → Mon. morning?
- Students spoke up → comfortable
- A little 'Let's move quickly' → Answered his own questions / finished student's answers

Other Comments:

- Good speaking voice
- Sort of stiff, seems comfortable, but a little overwhelming
- Don't admit people were lazy
- Define things if students don't get it
  - ↳ "Counter illumination"
- Act as a facilitator → Not bystander

Reflection

One thing impressed upon me through Delta classes is the need for collecting assessment on one's own teaching. In the fall of 2006, I taught as temporary faculty at Central Michigan University, teaching three courses. The first artifact above is of mid-semester evaluations from two of the courses I taught: A) Introduction to Geology; and B) Field Methods. These evaluations represent the first feedback I received from the students that semester. I included this artifact because it reminds me that things can go well, but there is always room for improvement.

I revisit these evaluations periodically, to remind myself of the importance for self-evaluation, and to make sure I have attempted to fix the problems. The first evaluation (A) is from the Intro to Geology class that I taught. Overall, I received good evaluations for the class, but there was one overwhelming issue the students had with my teaching style; the tendency to go off on tangents. This was a teaching strategy that I had purposefully included; I believed that by demonstrating I was a person outside of the classroom, the students would be more likely to respond. I included anecdotes and experiences from my research life, as well as amusing stories from outside the academic life. Usually, these stories were received with laughter, but my mid-semester assessments indicated that most students would rather just stick to the material that would be on a test. I found this mildly disheartening, as it indicated the students were just in the class to get a grade, and did not want the complete classroom experience of fully exploring a topic.

As a result, I did change my teaching style, and did not incorporate as many stories in the second half of the semester. I did not completely omit my stories, still believing that they served a purpose. Rather, I tried to find a common ground between my story-telling and the verbatim class topics. The stories were commonly linked to class topics (albeit loosely), and I believe that kept students from becoming obsessed with factual knowledge and helping them realize that the importance of context. However, part (A) of the first artifact serves as a reminder that no matter how well I think a class is going, class structure can be changed according to class dynamics.

The next part of the first artifact (B) is a mid-semester evaluation from a Field Methods course I taught. The class was structured such that I taught the first half of the semester, which was centered on field work, and another faculty member taught the second half, focusing on writing skills. The main component of my half was a field trip to the Upper Peninsula, MI. I had never been there before, and did not have the time to make the 10 hour drive before leading the students on the field trip. The assessment fairly accurately portrays the experience I had, as well as the students. I tried to maintain a high level of excitement, especially since this was the first geologic mapping the students had done, but it was difficult to identify the key places to take the students, without having visited there beforehand.

The assessment corroborates the feeling I had; the students wished I had more prior knowledge. The rock types were straightforward in identification, but knowing which swamp to cross or which trail to take was difficult. From this experience, I realized it is absolutely essential to have a complete understanding and preparation for field trips. A poorly run field trip is one where the instructor does not allot time correctly, and does not know where critical outcrops are located. Field trips are an integral part of geology courses; this artifact serves as a reminder that I need to devout the time to maximize the students' experience.

The second artifact again exemplifies my thought that there should be a continual assessment of how we are teaching. As stated, for the 2007-2008 and 2008-2009 academic years, I was the Head TA for the Geology & Geophysics Department at the UW-Madison. As the Head TA, I evaluate the new TAs, but also decided to evaluate returning TAs, trying to emphasize that TA development does not stop after the first year of graduate school. In addition, the TA evaluations were commonly done at the end of the semester, but I decided to make them a mid-semester evaluation, so the TAs could incorporate feedback. The TA evaluations were done in discussion (or lab) and instead of just handing back the evaluation form or sending an email, I sat down with TAs individually to discuss what could have been done better/what they did well. We then met as a group (while eating pizza), so we could share experiences. Thus, this artifact illustrates that I believe as instructors, we should have assessment of our teaching, which stretches beyond mandatory evaluations from the college or university.

The artifacts included in this reflection document some of my attempts to make assessment a two-way street, in which our teaching should be evaluated. A key component of this is that *assessment should be done in a time-frame that allows it to be useful.* I believe that assessment done at the end of the semester is useful, but would be more useful and more easily incorporated if it was done part way through the semester. As Head TA, I am also in charge of collecting and tabulating mandatory departmental scantron evaluations of the TAs. I have noticed that TAs do not see these as a useful resource; most commonly, TAs just want to know their average score, and do not ask to see the constructive comments written to help them improve. I do not think this is because the TAs do not care, but rather because they do not see the usefulness if they are no longer teaching the course, and may not be a TA the next semester. Thus, I believe assessment of teaching must be done with a sense of situational relevance.

B. Learning through experience, a dynamic process

Artifact: Delta Internship Final Report

Delta Internship Final Summative Report
Paul Riley
June 14, 2007

Abstract

Three labs were designed for an Integrated Liberal Studies class, Ways of Knowing in Science, in an attempt to teach science concepts to non-science majors. The three concept-centered labs (Empiricism vs. Theoricism, Scale Models, and Error and Uncertainty) focused on implementing pedagogic tools such as hands-on learning, recreating historic experiments, and critical thinking questions. An overriding theme, heliocentrism, allowed the labs to be focused into a single module spanning three weeks. Course lectures supported concepts covered in lab by providing science background on heliocentrism (e.g. the reason for seasons). To assess the students' absorption of the above science concepts, non-graded quizzes were conducted at the end of each lab, asking the students to apply the learned concepts to situations not covered in lab. Preliminary assessment results indicate that the majority of students were able to correctly recognize how to apply the concepts covered in lab, but lacked complete understanding of the definition of the concept. These results suggest that the pedagogic methods used (hands-on active learning, using historic events, and critical thinking questions) allowed the students in the class to grasp how to apply most learned concepts, but not teach the students the complete meaning of the concepts.

1. Introduction

1.1 What is the problem?

This internship was designed to teach science concepts to non-science majors using several teaching methods, including historical context, hands-on activities, and critical thinking questions. The basic problem we observe is that a disconnect exists between the focus of fundamental science labs (chemistry, physics, biology, geology) and the world outside science laboratories. The result of this disconnect is that non-science majors become scientifically illiterate, and hence do not fully grasp science stories covered in the news. Consequently, the question addressed by this internship is whether a series of labs could be created to help non-science majors apply three science concepts (empiricism vs. theoricism, scale models, and error and uncertainty) to situations outside the science realm.

1.2 What is known about the problem?

Science illiteracy is a prevalent problem throughout the United States, and is apparent in non-science majors in American colleges. The problem is epitomized in what current collegians value in an education. Students see gaining good work habits, time management, and a sense of maturity as the most important things to learn from college (Humphreys and Davenport 2005). The least important aspect of college: a general understanding of science and math, and how it applies to other subject areas.

The problem is severe enough to be addressed by the government; the National Research Council established the National Science Education Standards in 1996 (Robinson and Crowther 2001). These standards were created in order to develop a more science literate public, one that could understand the science behind the many problems in the world of physical and biological science. Outside of the governmental standards, it has been stressed that the science community needs to develop courses that involve a more processed based style of teaching and learning, so that students do not see science and math as useless skills (Halpern 2000, Hobson 2000, Robinson and Crowther 2001). Non-science majors, generally turned off by the learning of facts, often do not see that everyday experiences utilize scientific thinking (Colvill and Pattie 2002). In addition, this lack of recognition of scientific thinking indicates students are not well prepared for reading science news articles, and thus are easily misled (Halpern 2000, Norris and Phillips 2003).

1.3 What this internship contributes to understanding the problem.

This internship was designed to teach three labs that asked students to critically think about key science concepts. By addressing these concepts, the intent was to give the students a broader depth of knowledge on how scientists approach, address, and solve problems. The concepts, empirical vs. theoretical approach, error and uncertainty, and scale models, are tools/methods that we as scientists commonly use, but can also be applied to situations and materials outside the classroom. Thus, this internship was meant to help the students be able to apply those useful science concepts to science encountered outside the classroom, and enable them to make more educated decisions about what they see and read in the media.

2. Data collection and methods

2.1 Project design

This project was designed around three labs collectively grouped under a module "Heliocentrism." This meant that the three labs, although dealing with different concepts, all used heliocentrism as a common linking theme. Heliocentrism was not only used to link the three labs, but also to give the labs historical context. Basically, the students recreated the methods used by Eratosthenes in the 4th century B.C. The labs were taught in three consecutive weeks, incorporating material from the previous week. Each lab included thought questions, meant to help the students critically think about the content, and a short assessment at the end, meant to help me see if the students learned.

The first lab introduced basic math and graph reading skills, honing in on the concept of empirical vs. theoretical. First, the students were asked to make a series of observations, or measurements, on the radii and circumference of several different sized spheres. They were then asked to plot the radii vs. circumference using graph paper, and interpret the results, reaching the conclusion that the radius and circumference of a sphere are directly related. This was a demonstration of using an empirical approach: recording observations, and making interpretations based on those observations. Next, the students were asked to predict the circumference of hypothetical spheres if they were given the radius, using the empirical model $c=4\pi r^2$. This allowed them to use a theoretical approach: using a model to make predictions given a limited data set. This lab then tied in

Eratosthenes' experiment (he tried to determine the radius of the Earth in the 3rd century B.C.) by asking the students to figure out how to measure the Earth's radius using an empirical and theoretical approach. Creating a link between an overriding theme (Eratosthenes and heliocentrism) allowed this lab to be connected to the other two labs in the module.

The next lab was based on creating scale models to understand things we can not directly observe. The students were essentially asked to re-create Eratosthenes' experiment, but on a smaller scale. Eratoshtenes calculated the Earth's radius by 1) measuring the distance between Syene and Alexandria, Egypt, 2) Measuring the angle of a shadow cast by the Sun on June 21st in both cities, and 3) Realizing the Earth is a sphere and using trigonometry and geometry to calculate the Earth's radius. The students recreated the experiment by using hula-hoops and dowel rods. Using a light source, they measured the angle of the shadow cast on a hula-hoop at two different points on the hoop, and then measure the arc distance between these two points. Then, they used the same methodology as Eratosthenes, and determined the radius and circumference of the hula-hoop (most students were 10-30% off, due to unavoidable measurement error).

The last lab centered on the role of error and uncertainty in science. Erastothenes used a camel's known gait to measure the distance between Syene and Alexandria. The students were asked to hypothesize where there may have been error in his measurements (e.g. topography would change the gait). Next, the students were asked to draw a path from a starting point to an unknown ending point on a piece of paper, based on a series of directions describing distance and azimuth bearing:

A. Draw a line10 centimeters towards 000 degrees
B. Draw a line 10 centimeters towards 090 degrees
C. Draw a line 15 centimeters towards 313 degrees
D. Draw a line 7 centimeters towards 207 degrees
E. Draw a line 10 centimeters towards 150 degrees
F. Draw a line 9 centimeters towards 219 degrees
G. Draw a line 5 centimeters towards 154 degrees and stop.

The students did the experiment once with just a North, South, East, West compass drawn on their piece of paper, and no measuring device. Next, they were asked to repeat the experiment, but were allowed a ruler and protractor. Finally, they were shown the "true" endpoint, which as determined by myself using a series of precise measurements. The students were then asked 1) how precision and accuracy improved with the use of measurement tools, 2) how error accumulated throughout the experiment, and 3) how little errors throughout the experiment contributed to the uncertainty in the end location.

2.2 Key evaluation questions and methodology

There were two main forms of evaluation. The first was the actual lab handout for each week. This was a graded portion of the students' overall class grade, so the grade reflected the students' knowledge of the subject while they were doing the lab. Within each lab, the students were asked to complete an activity, and answer a series of questions pertaining to the material within the lab. The second key form of evaluation was the short, 5-minute assessment at the end of each lab. These assessments were single questions which asked the students to take the material learned in lab, and apply it to a situation outside of the lab. A grading rubric was constructed for each assessment to determine how much the students learned.

2.3 Examples of specific teaching and learning approaches and activities that you used to be an effective teacher for students with different backgrounds than your own.

I tried to give insight into where I came from, and how I got to be where I am. By giving the students some background about myself, I hope that they felt more comfortable with themselves in the environment. For the several students that had a slight language barrier, I tried to approach them personally, and let them share some of their background with me, if they wanted, in order to let them know that it was ok to talk, even if others have difficulty in understanding.

2.4 Examples of specific approaches you employed to develop and use learning communities.

In order to help facilitate the labs, and allow for a better learning environment, the labs were done in groups of 3, 4, or 5. This allowed the class to be broken into 4-5 groups, and helped students help each other, rather than deal with problems internally. I attempted to get some discussion going on Learn@UW, but most students did not use this resource unless they were required. Within the lab, I would periodically stop everyone, regardless of how far along they were, and have short discussions about some of the material, which allowed more thoughts to be aired between the small groups.

3. Discussion of evidence

3.1 What evidence do you have that participants learned something?

Most students were able to correctly answer the questions in the actual lab handout, due to active involvement on my part as well as relying on the group's knowledge. Thus, it was difficult to tell, based on the lab grades, whether the students actually learned anything. This meant that the other assessment, the short was vital in determining whether the students learned the concepts taught.

The first assessment quiz (Appendix A.1) was used to determine whether the students understood what an empirical approach and what a theoretical approach to science meant, and to give examples of each. This directly dealt with the science concept (empiricism vs. theoreticism) taught in lab. Results of this assessment, shown in Appendix A.2, indicate that overall the students seemed to grasp the two concepts, of which they had limited knowledge (based on discussion at the start of lab) when entering the lab. However, it is noted that the scores reflect a better understanding of the empirical approach, where observations lead to interpretations. As I see it, a theoretical approach, in which predications are made based on a model, is inherently more difficult to grasp. Students fundamentally see that if they make observations, they can then interpret those observations, but it is difficult for them to essentially work backwards.

The second assessment quiz (Appendix B.1) asked students about scale models. In the second lab, students were asked to recreate Eratosthenes' experiment using a hula-hoop. The experiment in itself was a success; the students were able to reasonably determine the hula-hoop's radius and circumference, which helped illuminate the historical experiment. However, results from the assessment (Appendix B.2) indicate that the students generally understood what a scale model was, could describe one, and indicate how to use one, but had difficulty in validating why they thought scale models were useful. This suggests that the hula-hoop experiment did not allow the students to fully realize the importance of scale models in other contexts. Although entertaining, the experiment should have been constructed to incorporate more examples of scale models to illustrate how widely used they are in science.

The third assessment quiz (Appendix C.1) dealt with the students' knowledge of error and uncertainty. Results (Appendix C.2) indicate that nearly all students were able to correctly answer the main question of the assessment, which was "What is the best way to construct a baseball diamond?" (see Appendix C.1 for complete assessment). Most students were also able to both validate their answer, and provide a detailed description about how error accumulates. These results indicate that the students likely were able to take the knowledge about error and uncertainty that they learned, and were able to apply it to a situation completely apart from the lab.

4. Lessons learned, what worked well, suggested changes/revisions

In all, this internship experience went smoothly. However, there are certain aspects that could be changed. I would encourage future internship participants to try and schedule their project for the end of the semester; much of the material covered in the internship seminar would have been useful before I did my project. The activities that I did, using a hula-hoop, asking the students to trace out a set of compass directions, and measuring spheres using different approaches, were a definite strong point to the labs. However, I think I needed to put more focus on slowing down, and actually make the students stop and think more about what they were doing. Most students tried to rush through each lab, and only thought about things when I stopped them, and asked them questions not included in the handout. I learned that in order to make the lab go smoothly, you have to be highly interactive with the students, and not assume that they are going to stop and think about each question in depth.

Another lesson I took away from the internship experience is that questions need to be framed correctly. For example, the 5-minute ungraded assessment for the Empircal vs. Theoretical lab asked about how to fix a car's headlight using each approach. In retrospect, this likely alienated students unfamiliar with auto mechanics. It may have been useful to provide a more open, inclusive question.

5. Conclusions

This internship, which used three labs to teach three science concepts, dealt with the issue of getting students to understand how scientists approach problems, and to use the concepts learned in lab to situations outside of the classroom. Assessment results indicate that the third lab, based on error and uncertainty, succeeded in getting the students to not only understand the concept, but also in getting them to apply the concept to a separate situation. However, based on assessment results, the first two labs did not fully develop the students understanding of the concepts. This may have been due to a tendency of the students to rush through the lab, and not fully stop and understand what they were doing.

6. References

Colvill, M. and Pattie, I. 2002. Science Skills- The Building Blocks of Life. Investigating, v. 18. p. 27-30.

Halpern, E.A. 2000. Toward Scientific Literacy for Nonscience Majors. The American Biology Teacher, v. 62. p. 276-281.

Hobson, Art. 2000. Designing Science Literacy Courses. Journal of College Science Teaching. P. 136-137.

Humphreys, D. and Davenport, A. 2005. How students view and value education. Liberal Education. P. 37-43.

Norris, S.P. and Phillips, L.M. 2003. How literacy in its fundamental sense is central to scientific literacy. Science Education, v. 87. p. 224-240.

Robinson, M. and Crowther, D. 2001. Environmental science literacy in science education, biology, and chemistry majors. The American Biology Teacher. P. 9-14.

7. Appendix

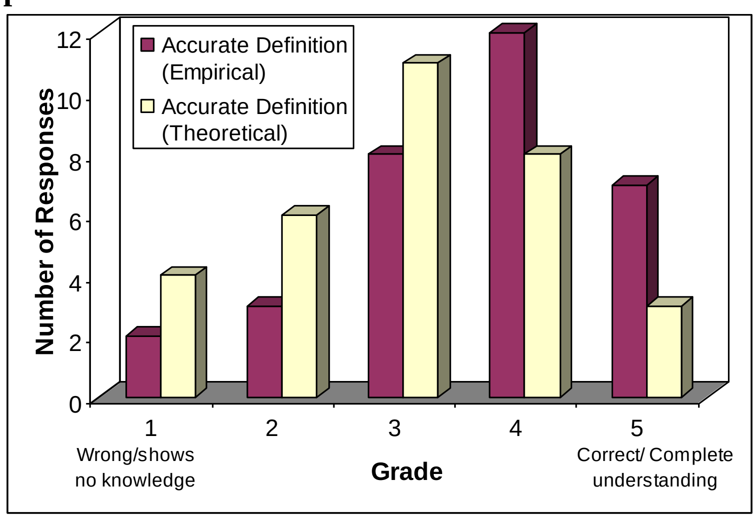
A. Lab 1

A.1 Empiricism vs. Theoricism assessment

As with all labs, here is the one-minute (ungraded, don't put your name) assessment to help both you and us evaluate what you learned.

Let's say that the lights on your car don't work some morning. How would you solve the problem from an empirical point-of-view? How would a theoreticist solve the problem?

A.2 Empiricism vs. Theoricism assessment results



A.3 Empiricism vs. Theoricism grading rubric

Concept	1	2	3	4	5
Did the student demonstrate they have an accurate working definition of the empircal approach to science	Student demonstrated no knowledge of the concept	Student recognized the term, but did not indicate a general understanding	Student indicated a general understanding of the term, but could not provide a definition	Student showed an understanding of the concept but did not show the observations to interpretations approach	Student showed a complete understanding of the concept
Did the student demonstrate they have an accurate working definition of the theoretical approach to science	Student demonstrated no knowledge of the concept	Student recognized the term, but did not indicate a general understanding	Student indicated a general understanding of the term, but could not provide a definition	Student showed an understanding of the concept but did not show the predications to models approach	Student showed a complete understanding of the concept

B. Lab 2

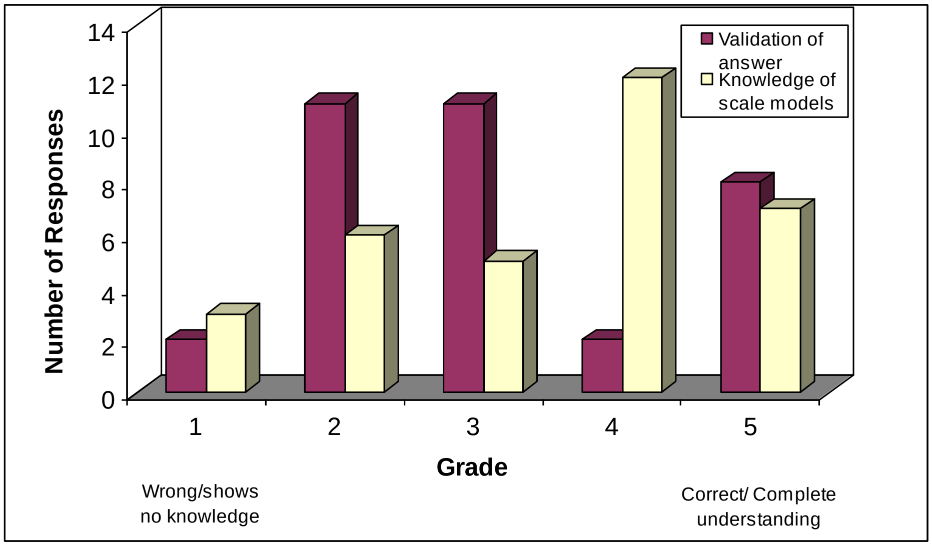
B.1 Scale Models assessment

As with all labs, here is the one-minute (ungraded, don't put your name on it) assessment to help both you and us evaluate what you learned.

Could Eratosthenes have calculated the radius of the Earth on any other day beside June 21? Why or why not?

We used a scale model to understand Eratosthenes calculations. Why is this approach so useful, generally, and how did it help you specifically?

B.2 Scale Models assessment results



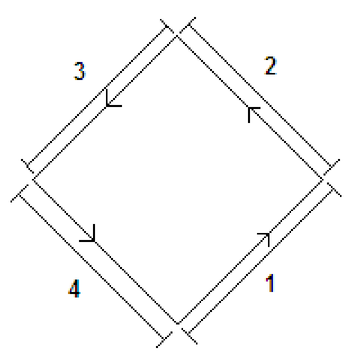
B.3 Scale Models grading rubric

Concept	1	2	3	4	5
For the first question, did the student validate their answer (If no, why? If yes, why?)	Student did not validate their answer	Student state there was no other date, but gave a wrong explaination	Student gave a no answer, and stated something about the shadows	Student gave a no answer, said something about the shadows and the lengths	Student stated no, given the tools and location, or yes if Era. was able to venture out of Egypt
Did the student offer an opinion on why scale models are useful, and why?	No, not at all	A solution to the problem was given, but did not address the question	Only one solution was provided, and did not show full ability to apply the concepts learned	Both solutions were provided, but student missed fully applying one of the concepts in the solution	A full explaination was provided

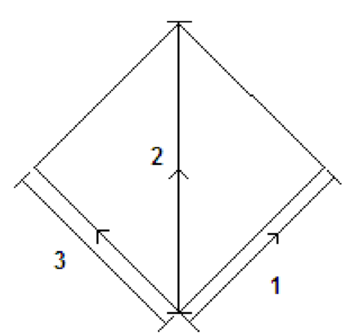
C. Lab 3

C.1 Error and Uncertainty assessment

Suppose you had to lay out a baseball diamond. You were given the spot where home plate should be, and are told to use that as your starting point. You know the distances between each of the bases, and the distance between each base and home plate. You are told you have two options to measure out the diamond, you can: Option 1) Start at home plate, measure from home to first, then measure from first to second, etc., like what you did in the lab, or Option 2) Measure from home plate to



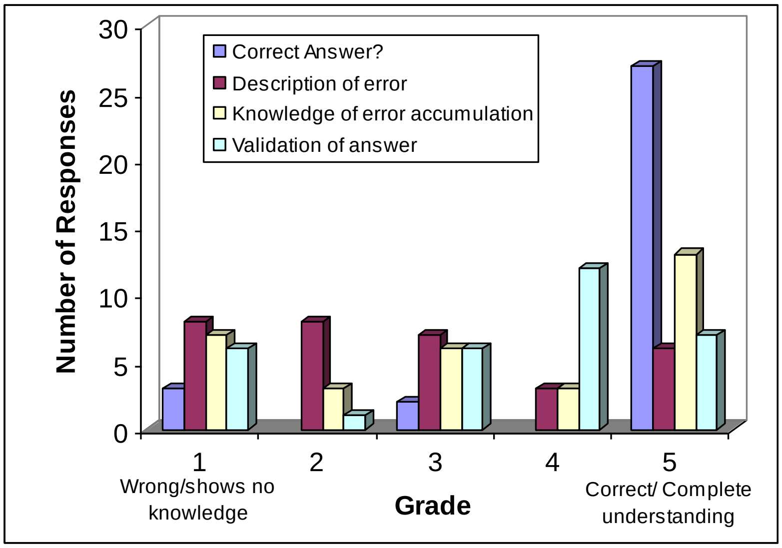
Option 1



Option 2

first, return to home plate, then measure home plate to second, etc. Which method would have less error? Why?

C.2 Error and Uncertainty assessment results



C.3 Error and Uncertainty grading rubric

Concept	1	2	3	4	5
Did the student pick the correct method?	No		Jumped back and forth, trying to validate either answer		Yes
Did the student describe how error would lead to uncertainty in the placing of each base?	No, not at all	A solution to the problem was given, but did not address the question	Only one solution was provided, and did not show full ability to apply the concepts	Both solutions were provided, but student missed fully applying one of the concepts in the solution	A full explaination was provided
Did the student demonstrate a knowledge of how error accumulates with dependent measurements?	No, not at all	Student mentioned something about error accumulation	Student recognized that error would accumulate with measuring from base to base	Student explained why error would accumulate, but did was not completely sure of the wording	Student fully explained error accumulation
Was the student able to indicate why it would be better to start at home plate for each measurement?	No, not at all	Student stated it was better, but did not know why	Student stated it was better and showed some understanding	Student identified why it was better, and stated why the other method had more error, but was unsure/unclear about the complete concept	Student identified why it was better, stated why the other method had more error, and showed complete knowledge

Reflection

For my Delta Internship at the University of Wisconsin-Madison, I helped develop three labs for the course ILS 153: "Ways of Knowing in Science." These labs centered on three broad science topics: 1) Empirical vs. Theoretical approaches; 2) Scale models; and 3) Error and Uncertainty. My first artifact consists of the final report for this internship.

Although I had been a TA for previous classes, the Delta Internship was my first experience actually creating materials that would be the major focus of a lab or class. The artifact from this experience is my final report, which illustrates the work I did throughout the semester. The Delta internship was a semester long experience that exposed me to all three Delta pillars (Teaching as Research, Learning Communities, and Learning through Diversity), but it dominantly reflects one of my experiences of Teaching-as-Research, which is the primary topic for this reflection.

Teaching-as-Research

My working definition of teaching as research is: a methodology utilized in teaching a subject in which the teacher incorporates literature-driven background knowledge into designing a course, and collects data on subjects to examine questions posed at the beginning of the course. Much like in science questions, the outcome in this process is not known at the beginning, and the end result may or may not support preconceived notions about learning. I use this approach to allow for a dynamical teaching style, allowing for change as more becomes known about improving connections to learners.

Teaching-as-research allows us to use our scientific background to improve our teaching. We can frame questions (Does Method A work better than Method B), collect data, and assess the results as they pertain to our question. This requires the formulation of hypotheses and set "teaching research" goals at the beginning of a semester. Too often, we are caught in the middle of a semester, thinking that there may be a better way of teaching the material, but not having the formulated problem to guide the thinking. Thus, I believe teaching-as-research is best utilized when a course is being taught multiple times, and based on reflections from the previous semester, guided hypotheses can be tested with the current semester. This exactly follows our approach to research; we collect preliminary data, create hypotheses, and collect more data to test the hypotheses.

I also believe that teaching-as-research fundamentally improves the course being taught, but also that ill-formed ideas can lead to disastrous courses. Much like in our research, if we have clearly defined, testable hypotheses we can achieve meaningful results, but if the hypotheses are not clear, our data collection and results may not answer our questions. In teaching-as-research, if the hypotheses are indeed clear, we can directly assess how whether Method A or Method B should be implemented. If the hypotheses are not clear, we may not be sure which method is better.

Teaching-as-research should incorporate assessments that are not incorporated into the students' grades in the class. Having graded assessments used for teaching-as-research may bias the results; some students have test anxiety and will inherently do badly due to uncontrollable variables. The development of the assessments in my Delta Internship demonstrates how I believe ungraded assessment should be used to rate student learning. In addition, I decided to use a rubric to evaluate the assessments, because it allowed me to evaluate both the students and the learning activity leading to the assessment. By asking myself specific questions about the assessment (e.g., Did the student validate their answer?), it allowed me to better examine the extent of the students' learning. The assessment results suggest that although most students got the correct answer, and could validate their answer, they still lacked an overall knowledge of error. Thus, the assessment indicates that the activity should likely be adapted, and be more geared towards understanding the actual definitions of error and uncertainty. The students could defend their answers, but could not explain the concept underlying their answer. This underlines the importance of developing an assessment, and corresponding rubric, that allows the teacher to investigate more fully whether the students grasped the concept. I believe that using a rubric in the manner allows the teacher to determine whether or not the assessment truly worked.

Learning through Diversity

The Delta Internship was not just a project; a class was taken in conjunction with the implementation of the instructional materials. Through this class, I became aware of the concept of learning through diversity, or that learning experiences are more robust and meaningful when student diversities are allowed to flourish. Based on the ideas touched on in the Delta Internship class, I decided to further my understanding of diversity by taking the Delta course "International Students, International Faculty". These two classes, with the experiences I have had during my teaching career, have formulated my thoughts on learning through diversity.

1) **The facilitation of learning through diversity requires the instructor to understand the student body background.** This may be through talking to students one-on-one to see their comfort level with controversial topics, or through assessing learning styles at the beginning of the semester. I believe that the instructor must make an effort to gain this information, or the instructor may fall into the trap of unknowingly alienating students through no fault of the student. The instructor must understand the backgrounds in order to properly design certain aspects of the course. I do not believe this means completely redoing a course, but rather incorporating otherwise unused methods to be inclusive.

2) **I believe learning through diversity breaks down stereotypes, and can open closed-minded students**. Learning through diversity permits the exploration of concepts through different sets of eyes, allowing a fuller learning experience. However, learning through diversity can only be achieved through the open-mindedness of the students. If students bring closed-mindedness to the classroom, it can be a very empty learning experience. However, my experiences as a teacher and traveler have taught me these biases most commonly arise due to lack of exposure to

cultures/backgrounds/learning styles. I believe that the instructor should include diverse examples in class, which can break down stereotypes and open minds. I believe this allows minority students to feel more comfortable in expressing their views, and enriches those students who may have previously not been open to alternative views.

3) **Learning through diversity yields better student work.** Often, we try to segregate our research life and our teaching life. However, one common aspect to publishing research is having our peers review our manuscripts before submission. Why is this done? *Because as researchers we recognize that diversity increases the likelihood of producing a great paper.* We need the other sets of eyes looking at our research, because we overlook things, or become used to doing things one way. We should learn from our approach to researching; utilizing student diversity will likely yield better student work. Students will be able to learn from their peers, using differences to produce a more complete assignment, project, etc.

Learning Community

The reflection following the next artifact centers on the concept of learning communities, but the Delta Internship experience provided me with an excellent chance to become involved in a learning community on a topic I believe in: promoting science literacy.

Basil Tikoff was the primary instructor for “Ways of Knowing in Science”, the course my Delta Internship addressed. Basil taught the course alongside Ph.D. candidate Nancy Ruggeri. Although Nancy’s research focused on the development the class, the course was not Basil’s primary research focus (structural geology). Basil and Nancy also decided to involve Shelley Crausbay, JoAnn Gage, and me in the development of the course. Apart from Nancy, our research interests were not in science literacy, but we all had a distinct desire to promote science literacy. Through a series of meetings, each of us contributed to the development of the class, bringing our own backgrounds and ideas to the table. Through the inclusion of all of our ideas, I believe the class was better developed than if it had been designed by one or two individuals. Thus, perhaps unknowingly, Basil and Nancy developed a learning community based around science literacy.

Basil and Nancy had the distinct opportunity to develop an excellent learning community. They had a group of people that were interested in the same topic, that volunteered to actively be a part of the group, and that were willing to devout time to further the development of the class. My next reflection elaborates upon the ideas presented here; namely, my ideas on what goes into a learning community.

Developing learning communities

Artifact

What is the ~~most effective~~ quality required for a good teacher?

- Empathy/Sympathy
- Organized
- Approachability
- Content knowledge
- Caring/Understanding
- Flexibility
- Complete Listening
- Fosters community
- Enthusiastic
- Communicator

↳ These are all qualities we want

How do we measure these qualities?

- For organized, give the students a topic + have them create an outline
- What is interfering w/ learning?

Approachibility - what % of students come to discussion

- what is working/what isn't working 3x5 card?

- Whatever tool you use, you must let students know you will use the information. → Respond to students
  → Gives the students a voice
  - Retrospective → Make sure you complete the loop
- Minute Papers → look @ numbers

Assessment makes Teaching a problem
↳ Keeps things changing/morphing to fit the class dynamics

Reflection on action - sit back + reflect on the semester
in action - changes on the fly, immediate changes

- what factors kept my students from learning

⟶ Early assessment! → Keep it as an ongoing process
→ Don't throw something @ the end of the semester

↳ If you aren't willing to change, don't do the assessment

Don't treat it as assessment as a burden/chore

Reflection

As mentioned, as a preceptor at Franklin and Marshall I learned the importance of having a learning community. For 2007-2008, I held the Head Teaching Assistant (TA) position for the Dept. of Geology & Geophysics at UW-Madison. Knowing the value of a learning community, I held bi-weekly sessions to help new TAs develop as instructors within our department. The next artifact is of notes I took from one such session, in which I invited Brian Bubenzer, from the TA resource center, to speak to us about how to incorporate assessment into our labs/discussions. After the meeting, I typed up the notes, and sent them to the new TAs as a helpful tool. I included these notes as an artifact for 'developing learning communities' because it represents the collection of feelings expressed by the TAs mixed with suggestions from Brian. Although Brian was invited as the speaker, this meeting was more an opportunity for the geology TAs to share their views on assessment.

I believe a learning community is a gathering of individuals with a common interest (e.g., developing teaching, sharing a course), that meet outside the designated time devoted (i.e., outside of class) to broaden their ideas about the common interest through a shared learning experience. However, I do not believe learning communities simply appear; learning communities form due to the identification of increased interest in a topic by either an individual or a group of individuals. This may be a teacher providing a forum to discuss controversial topics in class, or may be a group of students finding a shared interest in a genre of books. I believe a learning community is thus a way to provide a more fulfilling educational experience, and that it works through the sharing of diverse ideas from community members.

I believe learning communities serve two main purposes, they provide a discussion forum and also allow dissemination of information. Providing a discussion forum for people in the same situation (e.g., taking a class, being a TA, etc.) is vital in order to identify what is or isn't working for each person. For example, as the preceptor for the course "Earth, Environment, and Humanity" I set up a weekly time to meet with the students, at their dormitory (all students in the class lived on the same freshman hall). Providing a forum completely independent of the classroom and establishing the meeting at a place of comfort, allowed the students to feel more relaxed, and furthered the students' discussion of concepts learned in class. Discussions in learning communities can also be useful for instructors. For example, new TAs are often floundering, trying to adapt to the time crunch with balancing research, class work, and teaching. Conversely, some new TAs adjust quickly. The biweekly meetings illustrated by the artifact above were thus necessary not only for me to provide guidance, but also for the exchange of ideas between TAs.

The second purpose of learning communities is that they allow dissemination of resources/information. Making new TAs aware of campus resources and bringing in guest speakers with a wealth of knowledge filled this niche for the biweekly meetings. The artifact above, my notes from an assessment information session, demonstrates my belief of inviting outside guests to the learning community. The session was a success, with not only new TAs, but also returning TAs, attending.

The learning communities I have been involved with through my teaching experiences have helped me develop through my graduate career, but they have been far from ideal. My ideal learning community consists of: 1) A completely voluntary constituency. I ultimately believe that the best way a student benefits from a learning community is if they are there completely on their free will. However, I recognize that an “activation energy” may need to be supplied by the instructor to at least show students that learning communities are indeed beneficial. 2) A complete sense of equality and freedom of speech. I believe that although an instructor may initiate a learning community with a class (“Why don’t we discuss this paper further at the dining hall?”), all constituents should feel they are on a level playing field, outside the classroom. Again, this is an ideal learning community; realistically, an instructor will likely always be viewed slightly differently from the rest of the learning community (if thee instructor participates). 3) A forum of active participation and information exchange. I believe learning communities are the best avenue for hearing thoughts that would otherwise remain repressed.

Based on my experiences, learning communities facilitate understanding not only at the classroom level, but also at the research and teaching levels. I believe the development of a strong learning community, although it takes effort, improves learning for all parties involved, relieves anxiety involved with adapting to new situations, and is a fundamental necessity for a complete learning experience. As an instructor, I fully intend to facilitate the formation of learning communities for any given class. Ideally, I envision learning communities independent of me (as the instructor) that are able to sustain themselves without my input. Realistically, I envision myself forming a forum external to the classroom that permits a freer dispersion of ideas, and allowing the students to gradually adopt the responsibility of sustaining the community.

IV. Curriculum Vitae

EDUCATION

University of Wisconsin-Madison Madison, WI January 2007-Present

- Ph.D. (in progress, ABD); Field: Structural Geology; Dissertation title: Characterization and organization of fracture systems in the Tuolumne Intrusive Suite, Sierra Nevada Batholith, CA

University of Wisconsin-Madison Madison, WI August 2006

- M.S. in Geology; Thesis title: Spatial distribution of deformation bands and fractures in the Pajarito fault zone and implications for vadose zone fluid flow through the Bandelier Tuff, NM

Franklin and Marshall College Lancaster, PA May 2004

- B.A. in Geoscience, with honors, Cum Laude; Senior thesis title: Shear sense indicators in the Snake Range Decollement, NV

WORK EXPERIENCE

Head Teaching Assistant UW-Madison Fall 2007-Spring 2009

- Led new TA orientation, scheduled TAs in collaboration with the dept. chair, oversaw/evaluated new TAs. Responsible for TA issues and development.

Temporary Faculty Central Michigan University Fall 2006

- Taught Structural Geology, Introduction to Earth Systems, and Field Methods.

Teaching Assistant UW-Madison Fall 2004-2006, Spring 2007

- 2007-Helped lead field mapping trip to Canada. Responsible for identification of rocks and structures in the field, as well as developing orienteering skills.
- 2006-Taught lab sections and several classes of GEO 455-Structural Geology. Helped revise, develop, and implement existing labs for the course.
- 2004, 2005-Led discussion for courses “Gems: The Science Behind the Sparkle” and “The Age of Dinosaurs.” Graded term papers and responsible for ~120 students.

Preceptor F&M College Fall 2003

- Taught lab sessions and helped with lectures for introductory-level “Earth, Environment, and Humanity.” The teaching was incorporated into a “teaching as research” atmosphere; pedagogy class was taken in conjunction with the teaching experience.

Conference and Events Manager F&M College Summer 2003

- Managed 11 employees, responsible for overseeing conferences and events using campus facilities during the summer. In charge of payroll and scheduling.

Teaching Assistant F&M College Fall 2001, Spring 2002

- 2002-Assisted in teaching/preparing labs for upper level Sedimentology
- 2001-Led out of class discussion and helped teach labs for introductory level geology course

RESEARCH EXPERIENCE

Graduate Research Assistant UW-Madison Summer: 2005, 2006, 2007

- Summer 2008: Mapped location of fracture zones in Sierra Nevada Batholith, investigating the possibility of the fracture zones as hydrothermal conduits
- Summer 2007: Used Trimble 5700 and R7 series GPS receivers for studying elastic deformation associated with the San Andreas Fault, CA
- Summer 2006: worked on a 3-D gravity inversion on the Vinalhaven Intrusive Complex, ME
- Fall 2005: Integrated field data into hydrologic models to examine small-structure impact on fluid flow
- Summer 2005: at Los Alamos and Sandia National Labs, NM: Mapped distribution of small-scale structures, imaged highly porous material using laser confocal microscopy

ABSTRACTS/PUBLICATIONS

Simo, A., Tikoff, B., Gordon, C., **Riley, P.**, in prep, Deformation in the foreland of the Southern Tunisia Atlas: the Alima anticline. AAPG Bulletin.

Riley, P., Goodwin, L., Lewis, C., in review, Controls on damage zone width, structure, and symmetry in the Bandelier Tuff, New Mexico.

Riley, P, Tikoff, B., Murray, A.B., 2008, Self-organization and geometric properties of polygonal fracture networks, Eos Trans. AGU, 89 (53), Fall Meet. Suppl., Abstract NG23B-1131.

Riley, P. and Markley, M., 2007, Constraining the 3-D structure of the Vinalhaven Intrusive Complex, ME, using outcrop and gravity data. GSA Abstracts with Programs, v. 39, n. 6, p.

Goodwin, L.B., Lewis, C.J., Gardner, J.B., **Riley, P.R**., 2007, Seismic significance of fault-zone architecture in granular porous media. GSA Abstracts with Programs, v. 39, n. 6, p.

Goodwin, L.B., Rawling, G.C., **Riley, P.R.**, and Lewis, C.J., 2007, Non-plane strain in near-surface normal faults in granular porous media. Geophysical Research Abstracts, v. 9., n. 05875.

Riley, P., Goodwin, L.B., and Lewis, C.J. 2006. Variations in small fault densities and structural character with welding in the Bandelier Tuff, NM, and implications for vadose-zone fluid flow. GSA Abstracts with Programs, v. 38, n. 7, p. 26.

Riley, P., Goodwin, L.B., and Lewis. C.J., 2005. Spatial Distribution of Deformation Bands in the Pajarito Fault Zone, New Mexico: Implications for Vadose Zone Fluid Flow: GSA Abstracts with Programs, v. 37, n. 7, p. 374.

Grants/Awards

Vilas Travel Grant — UW-Madison — 2009
- Awarded for travel to an international conference in Australia on nonlinear dynamics in geology

Graduate Research Grant — Geological Society of America — 2008
- Proposal title: Documentation and characterization of lineaments in the Cathedral Peak granodiorite, Sierra Nevada batholith, CA

Grant-in-Aid — American Assoc. of Pet. Geologists — 2008
- Proposal title: Self-organization of polygonal fracture sets, Sierra Nevada batholith, CA

Thomas E. Berg Teaching Award — UW-Madison — 2008
- Awarded for excellence in teaching for an upper-level geology course

Field Course, Ridge Basin, CA — ExxonMobil — 2005
- Selected to participate in a week-long field course investigating a pull apart basin along a strike-slip fault

Geology Award Franklin & Marshall College 2004

- Awarded to the most outstanding Geoscience major

Hackman Research Grant Franklin & Marshall College 2003

- Proposal title: Investigation of the brittle to ductile transition along the Northern Snake Range Decollement, NV

Hammer Award Franklin & Marshall College 2002

- Awarded to the most promising sophomore Geoscience major

PROFFESIONAL DEVELOPMENT

Guest Lecturer Carleton College Oct. 2008

- Taught Tectonics lectures for paleomagnetism and apparent polar wander

Invited Speaker UW-Madison 1/17/08

- Invited to present material on instructional lab development for the Teaching Improvement Program, Dept. of Engineering

Delta Steering Committee UW-Madison Sep. 2007- May 2009

- Participated on the steering committee for the Delta program, which promotes continuing teacher education and development

Invited TA Evaluator UW-Madison 8/30/07

- Invited to evaluate short (~10 min.) presentations by future teaching assistants for the College of Engineering New Educator Orientation Program

Co-Facilitator/Presenter UW-Madison 5/30/07

- Presented material and helped lead discussion on the topic "How do we know our students are thinking critically" for the Teaching and Learning Symposium

Delta Internship UW-Madison Spring, 2006

- Developed and taught three labs for the course "Ways of Knowing in Science," an integrated liberal studies course for non-science majors. The labs were developed through a Delta Internship, which involved taking a course designed to facilitate thinking about teaching-as-research, learning through diversity, and developing a learning community

REFERENCES

Basil Tikoff
basil@geology.wisc.edu
Dept. of Geology & Geophysics
University of Wisconsin-Madison
1215 W. Dayton St.
Madison, WI 53706

Laurel Goodwin
laurel@geology.wisc.edu
Dept. of Geology & Geophysics
University of Wisconsin-Madison
1215 W. Dayton St.
Madison, WI 53706

Zeshan Ismat
zeshan.ismat@fandm.edu
Dept. of Earth and Environment
Franklin & Marshall College
Box 3003
Lancaster, PA 17604