TEAM #4

TEAM LIST:
Jonathan Davis
Lianna Eichberger
Trudy Gillivet
Kristina Obom

TEAM FACILITATOR:
Loretta Taras

Jonathan Davis
Doña Ana Community College, New Mexico State University, Las Cruces, NM

Assignment #1: Introductions

1) Describe your teaching responsibilities and the type of student you teach

Each semester I teach two sections of Human Biology (non-majors) and one section of Public Health Microbiology (health occupations majors). However, in the fall I will be teaching Natural History of Life (for biology & science majors). And I am expected to occasionally teach a diversity of courses, including Chemistry (for non-science majors; mainly used by health occupations students), human anatomy and physiology I & II (health occupations) and medical terminology. Overall NMSU is more than 50% Hispanic and female; the Dona Ana Community College (DACC) branch in Las Cruces, where I teach half my course load, is similar in composition to the university as a whole. However, I also teach at the Gadsden Campus near the Mexican border, where the percentage of Hispanic students is much greater than 50%. As a consequence, one big difference between Las Cruces DACC students and Gadsden students is that most Las Cruces students are either English-only or are bilingual with higher proficiency or dominance in English; most Gadsden students are bilingual with a high proficiency in Spanish or are Spanish-dominant. Probably about one-half of my students are planning to enter a two-year health occupation program (nursing, dental hygiene, respiratory therapy, sonography, radiography), the other half plan to transfer to a four-year program.

2) Describe what you would like to take home as a result of attending the SoTL Institute

Beginning in the fall of 2008, I began collecting and evaluating artifacts from my Human Biology students for local assessment purposes. Since an important feature of the Human Biology lab course (which is inquiry-based) involves the critical thinking tasks of creating hypotheses, making predictions BEFORE doing experiments and designing experiments to test the hypotheses, I decided to compare how well students create hypotheses and make predictions for their first lab exercise and for their last lab exercise to see if, in fact, my students leave the course with more ability to create a hypothesis than when they started the course. The data from the fall semester suggests that on average the students from both campuses did

improve and that the Spanish-dominant students improved as much or more as the English-dominant students (however, the sample size was small and I evaluated using a ranking scale of 0 (little or no competence), 1 (some competence) and 2 (high competence). I will do a similar evaluation at the end of the spring semester to see if I can replicate the results from the first semester. I will also use a similar inquiry-based lab teaching system in my biology majors course in the fall, and I used writing exercises in my other courses to teach about hypothesis creation, so what I learn about how students create hypotheses will be useful for all my courses.

3) Tell us about your interests outside of the classroom and a book that you've read recently

Although I got most of my college education away from home (eastern Texas, Colorado, Nebraska, Alaska, Sweden), I grew up and have lived on the US-Mexico border for more than half my life and my parents took us on frequent trips to Mexico to look at archaeological sites and encouraged their children to learn Spanish, which we did (I have accumulated ~30 graduate credits in Spanish, both linguistics and literature, and as a young person traveled extensively in Mexico and Central America), so I read primarily in Spanish.

Over the last year I read more than ten books from the reading list for M.A. students in Spanish, which covers Spanish-American literature from Independence through Romanticism and Realism (overall kind of disappointing, especially since the list contains only one woman writer; there are several others that I think should be substituted for some of the male authors on the list and I did add them to MY list). The previous year, however, I took a course in Spanish-American lit from the Conquest through the colonial period; in particular I enjoyed La Araucana, the epic poem about the conquest of Chile. My wife is from Spain and we travel to Spain twice a year on family business (about six weeks a year; however, I don't particular like Spanish literature from any period other than the Conquest). I've also read several novels by Naguib Mahfouz over the last year (in Spanish).

Assignment #2: Reflections

1) How would you describe your "research problem(s)" to the Research Scholars group?
2) What theme(s) based on your readings, resonate with your "problem" and/or your proposed approach to address your problem?
3) Based on Pat Hutchings article, what taxonomy would you use to describe your research question and why?
4) Do you have any questions/concerns/comments that have evolved from your reading?

I use an inquiry-based approach in the lab, which means the student always plays some integral role in the scientific process, although the exact role varies from week to week. The first role students learn about during the first lab is that of creator and tester of hypotheses. The emphasis in grading in the lab is never placed on getting a "correct" experimental result, or even creating the best possible hypothesis, but rather on how well student investigator creates a reasonable hypothesis, makes predictions that are consistent with that hypothesis, gathers data by observation or experimentation, and then evaluates the hypothesis by comparing the predictions to the results. For the past two semesters, my Human Biology students have done their first experiment requiring the creation of a hypothesis and the making of predictions

during the very first meeting of the semester, when it is expected that they will least competent (even many of the “good“ students may lack competence if “critical thinking” has not been an important part of their previous educational experience). Each student writes an Introduction paragraph for this first experiment in which he/she states the hypothesis and one or more predictions. Although we do not use this same experiment-based format every week, students do write a number of Introduction paragraphs over the course of the semester for experiments they have helped design.

At the end of the semester I assess the first Introduction to the last Introduction of the semester to see how many and which students have improved (in particular, distinguishing a hypothesis from a prediction is a problem for many students). In addition, after the first experiment I also have my students assess the first grading rubric; students both semesters have indicated that understanding the model for writing an Introduction is the area they know least about, so I am also developing an exercise with that in mind. However, I am not satisfied with current assessment method, which I feel is not sufficiently rigorous and/or unbiased, and I am currently developing a new method to assess hypothesis creation skills, and one which draws more directly on the students' own experiences since, in fact, we all create hypotheses and make predictions in everyday life whether we are scientists or not.

I was especially interested in Bass' practice of having students do an opening day reflective exercise to see what students know and what they think they know when beginning a course since most of the lab students are also enrolled in the lab course, and learning about the scientific process is also an integral part of the lecture course. I will design such an exercise for the first day of lecture so that students can assess their own status as well as help me assess what sorts of knowledge and attitude students have when they enter what for most is their first college science course.

Because I have an institutional requirement to do assessment, I am interested in "what works" for both own purposes as well as for institutional purposes. Yet I don't see "visions of the possible" as being mutually exclusive of "what works." In fact, I definitely want to "formulat(e) a new conceptual framework for shaping the thought" of my students. I know my students will continue to analyze their world using different strategies, but I want to them to see how scientists analyze the world as well by creating and testing hypotheses and then using the conclusions to generalize from the hypothesis to the theory. I don't see a "taxonomy" as much as various sides to the same multisided coin.

Assignment #4: Annotations

My main interest is to teach freshmen students, both biology and non-majors, the process of hypothesis creation.

Davis, Kimberly J. and Coskie, Tracy L. Hypothesis testing: it's okay to be wrong. Science Shorts: Classic classroom activities that emphasize science-process skills. Science and Children 46.6 (Feb 2009): p. 58 (Feb. 2009).

Students are often embarrassed at the possibility of being “wrong” and instead tend to try to learn specific information they believe the instructor wants them to learn.

Yet the process of science requires that the investigator/student be comfortable with creating hypotheses even though the hypotheses may be "wrong." In fact, the authors point out that we do not learn from the predicted outcome of an experiment, we learn from the comparison of our predictions with the actual outcome. The authors also encourage training students to use the common language of scientists, and they give the students a common framework with which to work which include writing as all stages and learning that averages and ranges of value, not individual numbers from specific individuals, are used to draw conclusions. Their student-centered process of science starts with a discussion (Van Dorn's "initiating event") and ends with a discussion, which can include the implications of the conclusions.

Johnson, Ronald and Kennon, Tillman. Experimental population genetics in the introductory genetics laboratory using Drosophila as a model organism. Journal of College Science Teaching 38.6, p. 14 (July-August 2009).

The authors describe in detail a simple, hypothesis-driven experiment using fruit flies, which has the advantage of allowing students to learn biological principles by observing the behavior of living organisms. It involves students in the creation of hypotheses, thus, the exercise is student-centered and inductive in nature. In addition to supplying detailed information on the method and examples of the data gathered, the authors also describe how the students prepare themselves for creating hypotheses and give an explicit description of the authors' method for incorporating writing into the learning process.

Kral, E.A. Scientific reasoning and achievement in a high school English course. Skeptical Inquirer. pp. 34-39. (May-June 1997).

Kral describes how he introduced a hypothetical-deductive model (Piaget's formal operational stage) to the teaching of 12th grade English. His students systematically analyzed characters from some works and predicted the outcome of other works. To accomplish this, students learned to identify and control variables for analyzing literary work. They also considered what may be probabilistic and correlational. The use of "scientific thinking" in a literature course is interesting since it could provide an opportunity…in a science course…to use a piece of non-scientific literature to illustrate options for performing analysis, thus, linking a humanity area to a science area (however, the piece analyzed need not be from the humanities). Kral's "learning cycle" included exploration, term introduction and concept application. He also collected and analyzed data from his students to support his conclusion that his students benefitted academically outside his classroom due to his hypothetical-deductive methodology.

Leonard, William H. Ten years of research on investigative laboratory instruction strategies. J College Science Teaching 18 (5): 304-306 (1989).

Since the mid-1980s there has been a shift away from laboratory instruction in college biology course that places the emphasis on following "cookbook" instructions designed to obtain "usable" data. Today using an inquiry-based approach, the scientific process rather than the results are emphasized, while allowing students to have, at least, some creative license. Such an approach can help students understand the nature of scientific questioning and correct misconceptions about science. Because inquiry-based exercises are student-centered, the student is more responsible for designing and executing a particular exercise. One important aspect of the scientific process is learning to create and test hypotheses using induction. For

this reason, some studies suggest that an inquiry-based approach not only fosters a better attitude toward science, but promotes cognitive development. Finally, not only do students seem to prefer an inquiry-based approach, but such an approach seems to be suitable for all types of college students.

Marshall, Pamela A. Using Saccharomyces cerevesiae to test the mutagenicity of household compounds: An open-ended hypothesis-driven teaching lab. CBE—Life Sciences Education 6: 307-315, (2007).

Marshall describes a two-week inquiry-based lab exercise, designed for an introductory genetic course that seeks to stimulate student interest and enhance the student's ability to design experiments and interpret data using brewer's yeast. Students investigate and then bring potentially mutagenic materials from home to create and test hypotheses about mutagenicity. Using S. cerevesiae has the further advantage of introducing students to a eukaryotic organism with similarities at the cell level to animal cells. In addition to creating hypotheses, the students develop their own protocols, collect and analysis their data and then present their results and conclusions to the class. The author preps the students for the lab with appropriate primary-source reading materials the author developed. She also assessed her students by having them complete a pre- and a post-lab survey to assess their knowledge of mutagenicity and alls students had to take a pre-lab quiz online via Blackboard. Finally, the author discusses the procedural as well as conceptual problems that students encountered while doing this two-week lab exercise.

Van Dorn, Kristy. Hypothesis-Based Learning. Science Scope. pp. 57-58 (Nov. 2006).

Van Dorn describes the approach she uses in her 7th grade classroom, which she calls "hypothesis-based learning" (HBL). Her approach is student-centered and starts with observation of instructor-provided prompts "initiating events"; when students observe a "discrepant event", they then propose an explanation (hypothesis), create a way to test the hypothesis (an experiment), including making predictions as to the expected outcomes if the hypothesis is supported. After the "initiating event, she attempts to give her students as much creative liberty as possible. Her experience has been that spending time at the beginning of the year learning to the initial steps of the scientific process means that at some point the hypotheses the come more freely, and the instructor's assessment task then becomes primarily to assess whether or not each student has followed the scientific process in reaching his/her conclusions. In addition, since the emphasis is not on a hypothesis being "right" or "wrong", the students lose their fear of being wrong.

Wisehart, Gary and Mandell, Mark. Problem solving in biology a methodology: a methodology is described that teaches science process by combining informal logic and a heuristic for rating factual reliability.

This system facilitates student hypothesis formation, testing, and evaluation of results and in conjunction with the logic path of the theory of natural selection is used to interpret new data. J College Science Teaching 37 (4): 24 (April-May 2008). Regarding biological education in general, the authors begin by stating, "In undergraduate instruction, the higher-level, problem-solving skills of application, analysis, synthesis, and evaluation have been largely ignored." The authors then break biology down into two fundamental areas:
the production of "factual information" and the creation of "scientific arguments" and describes in-class exercises using popular science articles and topics to have

students evaluate the reliability of “facts” in an article as well as the reliability of a writer’s argument. One important principle the student learns is that a particular article is only as reliable as its weakest aspect. Finally, the authors also present descriptions of exercises that can be done in class to evaluate the strengths and weaknesses of a particular hypothesis as part of learning about hypotheses. Their approach “presents a systematic methodology for teaching critical thinking in science” that “fully engages students.”

Lianna Eichberger
Utah State University, Utah Basin Regional Campus, Vernal, UT

Assignment #1: Introductions

1) Describe your teaching responsibilities and the type of student you teach

I teach at the Uintah Basin Regional Campus of Utah State University in Vernal, Utah. The campus is located in a rural community, and the student body is small (~1200 students total) and largely non-traditional. The campus is located adjacent to the Ute and Ouray reservation. Minority students are under-represented relative to the local community. Until recently, I held a half-time position with an emphasis on teaching, and a minor research component. I taught mainly microbiology for pre-allied health students, and some upper division (general microbiology, virology) and lower level (genetics) courses for majors. I was recently moved to full time. Starting next year, I will focus more on our undergraduate biology program by teaching and improving the curriculum for the introductory biology course for majors.

2) Describe what you would like to take home as a result of attending the SoTL Institute

I would like to take home two things from the SoTL Institute: skills for researching the effectiveness of my curriculum changes, and a new network of colleagues to share ideas and to collaborate with. Specifically, I wish to learn how to identify/prioritize the changes that need to made in the intro biology course (interviews, focus groups, literature, etc.), and to implement these changes and measure their effectiveness. I am very interested in expanding my research in the future to improve STEM education for native American elementary and secondary students, and to explore ways to help teachers improve science and math education in schools, especially for under-represented students.

3) Tell us about your interests outside of the classroom and a book that you've read recently

I have a 9 year old daughter involved in Junior Master Gardening through 4H, so we do some gardening together. Her dad and I are avid mountain bikers, and the kid likes to ride with us sometimes too. We have the sweetest desert single-track trails around, and miles of them. The family likes to hike with our black-lab in the red-rock areas near our home.

I recently finished “The Whistling Season”, a wonderful book by western writer Ivan Doig about early settlers in Montana. After seeing “Slum Dog Millionaire”, I’ve started reading about life in India in the novel “The Age of Shiva” by Manil Suri, a mathematics professor.

Assignment #2: Reflections

1) How would you describe your “research problem(s)” to the Research Scholars group?

I proposed two research problems in my BSP application. First, I want to study methods to help students develop their conceptual organization skills. Many of my students have trouble categorizing within and making connections between concepts.

They use terms inappropriately in discussions and in essay answers on exams demonstrating weakness in conceptual organization. What does the literature have to say about developing conceptual organization? Would teaching strategies such as the use of concept maps or the emphasis of properties (characteristics that define and distinguish) versus functions (characteristics that describe how it works) of topics help students make connections more easily? What assessment methods are best for measuring learning gains in this skill?

Second, I would like to identify the most critical challenges to recruitment and retention of biology majors at our small, rural regional campus. What can I learn from the literature about retention in STEM disciplines? What can I learn from current students and graduates about their perceptions of biology as a discipline and career? What methods are appropriate to collect information from these students? While the question of recruitment and retention is important to me, I will likely focus on the first problem of conceptual organization. I believe that changing our introductory biology course to a more active and inquiry based learning environment as planned will have the greatest impact in make biology more appealing to students as a major.

2) What theme(s) based on your readings, resonate with your "problem" and/or your proposed approach to address your problem?

The discussion about classifying the type of question being asked (Pat Hutching's article) resonated with me the most. Just like studying taxonomy of living orgasms helped me see connections between organisms at all different levels of complexity in body structure, the article showed me that SoTL questions being asked have varied levels of complexity, are related, and can overlap. The short descriptions of SoTL projects gave me a good feel for the different scopes of questions being studied by others who are more experienced. The author stated that most researchers start with "what works" questions (as is evident with me and many listserve responses). I can see how this is a good starting place for thinking about student learning and using your research experience to think about and identify more probing and complex questions. It made me think about my research less as a solution to a problem and more as a launch point to a deeper understanding of how students learn biology.

I also found the Bass article "What's the Problem" to impact my thinking. I already was familiar with and on board with what he was saying. But reading the section "Benchmark Understanding" made something click for me. It made me aware that I might assess whether students are modifying the way they think about biology after taking my intro biology course. I would like to spend some time to modify his "pre/post test from probing about how students interpret artifacts to how they interpret different biological structures (hopefully they will learn to see evolutionary relatedness if I teach the course properly). I like this fist-day-of-class activity to emphasize metacognition, and to set the tone for the course. The modification would have to incorporate what the big picture in biology is, how biologists think about new information and make connections. Perhaps this is something others in the group would like to do too?

3) Based on Pat Hutchings article, what taxonomy would you use to describe your research question and why?

I would describe both of my problems as "what works" problems. The way I have proposed to study student conceptual organization skills by trying different learning tools is obviously a "what works" question. After having done the reading

assignment though, I can see how this question can morph into a "what is" (and maybe even a "visions of the possible") question to try and understand how (and why) students organize new information. My second problem seeks to describe the reason for low numbers of biology majors. I think of this as more of a "what works" question since my goal is to identify a method(s) for recruiting and retaining students. Perhaps this can also be a "what is" question that describes perceptions of students at our campus (that hopefully I can influence).

4) Do you have any questions/concerns/comments that have evolved from your reading?
I really appreciate that these articles are about student learning in general, not just biology learning. This reading assignment has been very timely for me. I have been charged recently with organizing the faculty at our campus to discuss how excellence in teaching should be evaluated. Each faculty member has teaching as a major role, and so we must be excellent teachers. The faculty is a multidisciplinary group belonging to many different departments from all colleges at the university, so our discussions of teaching is in broad terms. We have decided that we must be scholarly about our teaching in order to be excellent. These readings have been very timely to our discussion.

Assignment #4: Annotations

My primary research interest is to identify ways to help students develop conceptual organization skills to improve their critical thinking as I design my first year biology course. Concept maps intrigue me, so I began by searching for "concept maps" in CBE Life Sciences and ERIC. I also looked at the Visible Knowledge Project where I found the Levy reference, and the Gallery of Teaching and Learning at the CASTL site where I found the Brown reference.

Khodor, J., Halme, D.G., and Walker, G.C. (2004). A Hierarchical Biology Concept Framework: A Tool for Course Design. Cell Biol Educ 3, 111-121.

The authors acknowledge that student misperceptions often lie in the broader biological concepts (likely because courses emphasize details over the big picture). To address this concern, they describe their motivation and the process by which they developed a Biology Concept Framework (BCF). The product is a framework of top-level concepts, each supported by concepts organized in a nested hierarchy based on relative importance. Many of the supporting concepts are cross-referenced. Benefits of the BCF for the authors include making top-level concepts more explicit in our teaching, and using the framework as a tool for students to "place details in the context of concepts."

I would like to explore the BCF in more depth as I build my introductory biology course. I can see it as a tool to help my students and me make connections between details and concepts, and to emphasize context.

Levy, S. A. (2009). Reading the Reader in The Difference that Inquiry Makes: A Collaborative Case Study of Technology and Learning, from the Visible Knowledge Project. edited by Bass, R. and Eynon, B., reprinted from the January 2009 issue of Academic Commons. Retrieved July 4, 2009 from the Visible Knowledge Project website: https://digitalcommons.georgetown.edu/blogs/vkp/2009/02/20/levy/

Levy describes her research on evaluating the proficiency of text reading by students, especially those with poor academic literacy skills. Her approach was founded in the Critical Inquiry method for reading that "encourages students to become active participants responsible for their own learning." She had students use Microsoft Word's comment feature to annotate reading assignment to guide student metacognition of reading as an active process, and to develop proficient reading skills.

This article is useful to me by providing a method to help my students become more active readers. It also has ideas about making connections that could be incorporated in my research.

Brown, J.S., Collins, A., and Duguid, P. (1989). Situated Cognition and the Culture of Learning. Educational Researcher 18, 32-42.

The authors bring to life the importance of context in learning in this accessible 1989 review. Learning activities performed by students in a typical classroom context are contrasted with those of an apprentice ("just plain folks") and a practitioner. The authors argue that students will experience more meaningful learning of they are given "authentic activities" that are more aligned with those of an apprentice and practitioner than that of a student in a typical classroom. Two examples in mathematics are described to illustrate learning as a "cognitive apprentice." I highly recommend this article; it provides a wonderful framework for describing a view of teaching and learning that I recognize as constructivism.

Novak, J.D. (2003). The Promise of New Ideas and New Technology for Improving Teaching and Learning. Cell Biol Educ 2, 122-132.

In this article, Novak provides evidence for using concept mapping as a tool to develope and assess the progress of "meaningful learning." A method of using concept mapping software (CMap 3.0, http://cmap.ihmc.us/conceptmap.html) to identify student misconceptions and to construct knowledge through synchronous and asynchronous collaborative work is described. This software allows students to link various electronic resources (documents, images, web pages) to concepts thus creating elaborate ePortfolios on a subject. Novak also discusses the limitations of traditional summative assessment of "near rote-mode" learning, and provides a good review of assessing meaningful learning with references for further reading.

This article is probably the most relevant to my research question. It provides ideas about how to structure class activities or projects to foster conceptual organization. It is also a good resource for further reading.

Mintzes, J.J., Wandersee, J.H., and Novak, J.D. (2001). Assessing understanding in biology. Journal of Biological Education 35, 118.

In this review, the authors discuss methods of "assessing understanding of biological concepts as a principle route to meaningful understanding." Specific criteria for understanding are discussed. (I can imagine incorporating these criteria into course learning objectives.) Several techniques to assess understanding for both students and instructors are described. The article concludes with a list of suggestions for instructors interested in improving classroom assessment for meaningful learning.

This article is a good resource for considering new or alternative methods of formative classroom assessment.

For my use, this article supplements the Novak article above by summarizing the use of concept maps and concept map-based ePortfolios as a method for formative assessment of meaningful learning for both students and myself.

Trudy Gillivet
Northern Virginia Community College, Annandale, VA

Assignment #1: Introductions

1) Describe your teaching responsibilities and the type of student you teach

I'm an Assistant Professor of Biology and Natural Science on the Annandale Campus of Northern Virginia Community College.
The college is the largest institution (over 64,000 students/ over 27,000 FTEs!) of post secondary education in the Commonwealth of Virginia and we are very diverse. Students attending our 6 campuses collectively speak over 114 languages. The oldest and largest campus is Annandale (over 30 % of the total enrollment); only Alexandria campus begins to approach our size, but their student population is slightly more diverse.

I find the data astonishing and fascinating at once. Teaching here is great fun because I meet people from so many different countries, cultures and backgrounds. Collectively, for all campuses:
16 % of our students are Asian;
16 % of our students are black/ African American;
13.5 % of our students are Hispanic;
not quite 1% are Native American;
47 % are white/Caucasian.
But I wish I could show you the faces of all these wonderful students. We are a rainbow of humanity.

I teach General Biology 101 and 102 to non-majors and majors, Introductory Cell Biology (206) for majors and others interested in Sciences or pre-professional areas, Health Sciences 1 & 2 (NAS 161 & 162) for Allied Health majors (students entering Nursing, Respiratory Therapy, Physical Therapy, Dental hygiene and other areas in Allied Health). The core of this course is an in depth study of Anatomy and Physiology with a brief introduction to Microbiology and Pathology as pertains to the Human systems. Also, I teach an introductory Human Biology, a one semester overview of Anatomy and Physiology for students who may continue on in the Health Science field, or enter targeted programs, e.g. EMT courses.

2) Describe what you would like to take home as a result of attending the SoTL Institute

The Math Science and Engineering Division on Annandale campus has larger enrollment than the total enrollment for 2 of the smaller campuses of NVCC! Math and Biology top the list.

So how do we address individual students in spite of our size? That is one area in which NVCC ("Nova") consistently receives high marks: personal attention. All of our faculty take pride in their personal approach.

I tell my intro Biology students that I will know if they are not in class every day, unlike some introductory science courses at larger 4 year universities in the Commonwealth, or elsewhere. I work hard to learn each student's name and details about her or him and the reason each has for coming to college. What goals a

person has is one window into motivation. Plus, personal connections often drives a student to want to succeed (as I am sure many of you know), especially students who may not have had the best educational opportunities, in their past.

Because we provide Public Education at the College level, we are open access. All who sign up, and pay, are welcome and encouraged. It's one of the factors that creates a challenge in the classroom. Don't doubt it. We have our share of very capable students who, for a variety of reasons (often economic) , begin their 4 years of college education at the community college and are highly capable, and go on to Bachelors, Masters and even PhDs. One former student who keeps me in her email list is studying for her PhD in American History, just across the river at George Washington University.

The general population is a mix of students right out of high school, new English speakers, people who are recent immigrants and other students, who, for a variety of reasons, came late to the idea that advancing their opportunities through education may be a good idea. We have many career changers.

One of the reasons I am very interested in the SoTL experience is my desire to improve education for the broad range of students I encounter each semester. I am especially interested in learning authentic ways to do research and measure outcomes. One area in which I hope to focus throughout this year is a way to connect more successful students with students who do not have good study skills, aiming to improve the success of the entire group.

Am eager to be among a group of like-minded educators who are also interested in the processes of teaching and learning and how we can improve these activities for our students.

3) Tell us about your interests outside of the classroom and a book that you've read recently

Outside of teaching, I attend soccer games, orchestra events, etc., for my 2 daughters and am chauffeur to many events, Girl Scouts, and otherwise. For my own time, I love to hike and be out of doors; often this involves our big yellow dog. I enjoy nature photography and hearing live music of almost any kind. Have recently acquired an acoustic guitar and am learning the basics…. No time pressure, but learning to play has been on my "someday" list long enough. Now it's time to let myself begin to explore this artistic side of myself.

One book I read awhile ago and have recently re-read is "A User's Guide to the Brain," written by John Ratey, M.D., a psychiatrist at Harvard. The roles that both sleep and movement play in learning are fascinating. Also, like to read books by the geneticist, Sean Carroll (U. Wisconsin), who has a knack for making science accessible to a lay audience. That is what I aim to do in my classes and love to learn at the masters' feet. Am reading his "Making of the Fittest," currently. For a very quick light read (2 nights, max.) I have just finished "Testimony" by Anita Shreve. Like Barbara Kingsolver and Anne Tyler novels too, but haven't read any of their books in awhile.

Assignment #2: Reflections

1) How would you describe your "research problem(s)" to the Research Scholars group?

One problem I have identified in teaching students at the Community College courses in Introductory Biology, Health Science and Introductory Cell Biology is a subset of students who do not have college level study skills or preparation, perhaps in science, but additionally in broadly applicable college success skills. I would like to pair students who have had some success in college level courses with first time college students and explore whether peer mentors can assist first time students achieve higher levels of success in Introductory Biology courses.

Many of the students in the Introductory Biology courses, (where I will initially focus) take Biology to "check a box" or meet a core requirement. Its undoubtedly true that some students think they don't need science, (they think of it as just a hurdle to jump to get to their desired program) a strong argument can be made for the opposite contention. Perhaps some of my fellow Biology scholars are likely initiate a similar conversation with their students; in this ever complex and increasingly global world, a solid foundation in the core ideas of Science are critical for all citizens to fully participate, understand, debate and evaluate issues society faces nearly every day.

A second, related issue, I would like to examine is students' background knowledge in Biology, and preconceived ideas about Science, when they begin a course: their prior knowledge. I would like to link to this initial assessment of core Biology knowledge with learning study skill to assist students to identify effective approaches to study for Biology.

2) What theme(s) based on your readings, resonate with your "problem" and/or your proposed approach to address your problem?

Many ideas from Randy Bass's article resonate for me. I had read this article prior to it being assigned for the BIO scholars group. His interest in student preconceived notions resonates. Additionally, I appreciate the way he has shifted towards giving students an over arching view of how to approach the types of reading necessary for success in his literature classes. He is interested in teaching from the Learner's perspective. Knowing where the students are coming from, learning to see how the students perceive, or understand, or do not understand, core concepts has been an area of continuing, and deepening interest for me. Am interested in developing ways to assess this more formally vs. anecdotally.

At beginning of one second semester of Introductory Biology, I gave students an informal survey, asking them casual definitions of topics I was certain must have been discussed in their first semester course. Overall, the class's reaction was quite surprised; while some students had clear concepts of major ideas, (e.g. mitosis), others could not begin to distinguish main ideas that certainly had been presented.

I am interested in the idea of Focus Groups as described in the work of Pat Hutchins. I would like to explore further how focus groups have been used in other courses and what types of questions they have helped faculty ask. I think they might be useful as a way to survey students about study skills and for gaining a sense of the students familiarity with core Biology topics .

3) Based on Pat Hutchings article, what taxonomy would you use to describe your research question and why?

My questions relate to both the “what is” and “what works” areas. The “what is” describes the background knowledge and skills students bring to class on the first day. The “what works” category relates to tangible ways students may be helped by linking to students who already have solid study skills in place.

4) Do you have any questions/concerns/comments that have evolved from your reading?

One question I have is about asking, OR requiring, students to become paired in my courses. While there is always some shared activity and group work, especially in labs, it rarely involves discussion of study approaches; groups have focused more on Biology content. However, this semester I have initiated a Discussion Board for students to explore their learning styles via a survey on website; they then post their findings and discuss with classmates new approaches they have identified, or tried, due to the survey results. I wonder if it would be the best use of class time to initiate some of this dialogue in person.

Other concerns or questions I have are related to a topic that Conrad Toepfer brought up in his discussion (dated 6-7-09). I, too, have noticed that students do not access or process the material in the same way as my earlier students seemed to, even a mere 6 years ago. I have aimed to become more technologically savvy, and do work to provide relevant links, and now video clips, along with the publisher provided electronic materials. While I would still prefer to see these materials as supplements to, not in place of, reading the textbook that is a very teacher-centered perception. I have no problems if students read the text online via the eBook version (and find myself doing more of the same, e.g. these 3 articles we read). However, I feel one develops a deeper understanding from reading paragraphs and sections that collectively build to some overall arching concept. But I do recognize the conundrum I am dancing around: not everyone learns best or most effectively by reading text; the content in introductory Biology is so very complex, describing some topics without many written words,,,,, ? I am very interested to hear other scholars thoughts on this issue.

Assignment #4: Annotations

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*“…taking the relative **luxury of time available** in the summer to let you begin to immerse yourself in the literature.”*

Chuckled when I read the above……Has been a crazy end to first Summer session. Sorry to be so late. I am looking forward to meeting everyone in person next week. Best, ~Trudy

When I first sent in my application for Bio Scholars I received a phone call, “You plan to study ALL of these questions ?” Perhaps, eventually, yes.

In order to define a focus, I chose to narrow my focus to a few key questions. These are posted in the Wiki.

The questions focus on developing a way to authentically assess students study skills particularly for Biology/ Life Sciences. I am interested in linking capable students and inexperienced students to explore whether peer learning can increase the success rate of the least college ready students.

McEwen, L. A., Harris, D., Schmid, R. F., Vogel, J., Western, T., and Harrison, P. 2009). Evaluation of the Redesign of an Undergraduate Cell Biology Course. Cell Biol. Educ. 8, 72-78.

The article provides a summary of an Evaluation of a course Redesign for an Introductory Cell Biology course. Two metrics used to evaluate the effectiveness of this particular redesign were a Science Laboratory Environment Inventory which allowed students to report on distinct areas of the lab environment for example open ended-ness of the lab experiments, extent to which the lab was guided by formal rules, integration of the lab with the non-lab components of the course, and adequacy of lab equipment and materials.
The second instrument was a matrix of curricular skills specifically designed to assess 20 defined laboratory techniques.

Why this article is useful.
I am interested in learning about developing tools for authentic assessment and may be able to model assessments on one or both of these instruments. Also, it focuses on the idea that while having and implementing new ideas is fine, studying whether or not they are effective is just as important and that this step is often overlooked. I identified with this statement to a great degree. Knowing how to assess effectiveness and when to keep employing or try something new are central steps, and ones in which I can improve for my classes.

Miller, S. Pfund, Christine Pribbenow, C.M. and Handelsman, J. (2008). Scientific Teaching in Practice. Science 322, 1329-1330.
In this research article the authors report on a Teaching Fellows program at University of Wisconsin-Madison in which Graduate Students and Post doctoral Fellows were placed into cohorts with the goal of learning to foster scientific creativity, scientific reasoning and problem solving in undergraduate Biology courses. Active learning included use of hand held response devices, response to multiple choice or conceptual questions, analysis of case studies and engaging in discussion in small groups. It was found that the majority of graduate students and Post Doctoral Fellows involved in the 3 years of this study, agreed that scientific teaching is effective, that the instructors rated themselves as good teachers and that they felt engaged as a part of a scientific teaching community. One of the hallmarks of the scientific teaching moved emphasis away from the teacher as the center of the class and made the focus instead be on the students as learners with their own inherent responsibilities for engaging in the learning process.

Why this article is useful.
Several of the traits identified as student centric classes parallel my own approach, so the validation is nice, including I will employ the method of including a baseline assessment of prior knowledge in each class in future sections and use this as a frame of reference for comparison at the end of the course. Questions on assignments will also be studied to ensure a range of learning objectives are being assessed. Furthermore I plan to study how the activities I include as part of my study will both engage students and serve as a means of assessing students' gains.

Crowe, A. Dirks, C. and Wenderoth, M. P. (2008) Biology in Bloom: Implementing Blooms' Taxonomy to Enhance Student learning in Biology. Cell Biol. Educ. 7, 368-381.

In this study the authors develop an assessment tool, Blooming Biology Tool (BBT) to assist Biology faculty in evaluating the effectiveness of their teaching and meeting a variety of educational objectives. Use of the tool additionally helped student to learn study skills and how to think about thinking and learning (metacognition). The tool is based on Bloom's Taxonomy of Learning Objectives which groups questions into lower order skills, (rote memorization to simple comprehension) and higher order skills (from deeper understanding, analysis and evaluation). The authors applied to tool to a wide range of questions prepared for Biology students in a variety of college settings. It was a useful tool for evaluation of research proposals in an introductory Cell Biology course, in a upper level Physiology course, and in a workshop for upper level course that spanned a year long program and included labs, lectures, and seminars and which integrated concepts from the fields of immunology, cell biology, virology, organic chemistry, and biochemistry.
Students in the workshop were also instructed and learned how to evaluate questions using the Bloom's taxonomy. Both analyzing questions and learning to write good questions proved to be a valuable study skill for many of the students.
The authors concluded that their tool did prove very useful in both assessing students and in helping faculty to evaluate and re-think their approaches to introducing concepts.
Using defined learning goals allows the Instructor and the student to understand the different levels of challenge presented by different types of questions.

Why this article is useful.
I would like to implement this tool (BBT) to introduce students to skills beyond rote recitation of memorized facts for examining the development of students' study skills. It will also be useful to assess the appropriateness of the questions being used on Exams. In previous classes I have given students opportunities to design some Exam questions. Perhaps doing so in the reference frame of Bloom's Taxonomy, over several weeks, will allow students to learn the distinction between such skills as list and name (knowledge level) vs. analyze or explainthe relationship to… higher level analytic objectives. While I In many classes I have introduced Bloom's Taxonomy in many classes, I have not done so in a consistent or persistent manner. Therefore I am interested in employing this tool to study whether teaching students about the hierarchy of levels of understanding will improve their learning In addition to using the tool to assess students learning, I am interested , in use of the tool to insure that the level of questioning is appropriately aligned with the level the introduction of the material being studied..

Kimberly D. Tanner, Kimberly D. (2009) Talking to Learn: Why Biology Students Should Be Talking in Classrooms and How to Make It Happen *Cell Biol. Educ.* 8(2): 89-94 2009, DOI: 10.1187/cbe.09-03-0021

This article details the value of providing opportunities for student to talk in class and address questions on newly introduced topics. Ideally the question is not one that is quickly answered with a one or two word. Rather, it's a questions designed to elicit alternate explanations or promote discussion. Further the article discusses common barrier to this approach and gives reasons to alleviate or overcome them.

Why this article is useful.
I am particularly interested in motivating students without solid college level study skills. One way I would like to approach this issue is to pair such student with their peers who have navigated science successfully and who have sound approaches.

This article discusses using Student Talk (with or without clickers); getting the mouth moving and doing the mental work required to think through a newly learned idea uses a different brain region than simple auditory input , regardless of how focuses and attentive a student is. In casual observation, I have noticed its much easier to be attentive (especially in an area that they deem "hard" or is not truly their favorite) it they are engaged… if they must contribute with their peers.

I think one simple, but hopefully effective technique I am likely to employ with a class in the Fall, is use of an index card, that may or may not be collected. Already I have students writing something for submission, (and points) each class. By adding the dimension of discussion with a classmate, more students may gain both in skills and content knowledge. The real benefit seems to come to the students who talk (vs. students who primarily listened to their classmates).

Additionally, I found value in the ideas in the article that getting students talking and thinking things through out loud is in itself a valuable skill; am very interested to have student learn that developing thinking skills is far more important that learning a list of memorized facts. The idea that students can talk to think something through without having all the "answers" or information is novel to some students. While they may do so privately, some students are much more reticent to do so in a class environment unless that atmosphere is particularly encouraged.

Carnegie Foundation for the Advancement of Teaching. Strengthening Pre-Collegiate Education in Community Colleges. (2008). Basic Skills for Complex Lives. Designs for Learning in the Community College.
http://www.carnegiefoundation.org/publications/pub.asp?key=43&subkey=774

This monograph is a detailed report from the Carnegie Foundation and encompasses several years of study. The William and Flora Hewlitt Foundation together with Carnegie have been engaged in increasing student access and success in Community Colleges in California. Ultimately it details the need to improve the development of basic core skills "Pre-Collegiate Skills" that will allow students to be successful in continuing their college education. Five principles are identified that demonstrate an understanding of teaching these basic skills.

"1. High Structure 2. High Challenge 3. Intensity 4. Intentionality and Learning How to Learn 5. Inquiry and Making Learning Visible"

The report further describes ways that employing these principles may improve all courses, not only developmental courses. The value of this report cannot be overstated. At a time when community college enrollment is dramatically increasing, there is a definite need to bring the highest level of academic preparation to this population of students.

Why it will be useful.

I am only focusing here on Principle 4 above, "Learning how to learn."
One of the most persistent factors I have identified with students who struggle is being unable to handle college level work; they have not been previously exposed to rigorous thinking they believe every thing they need to know will be presented in exactly a word for word format in class and that if they simply memorize and recite they will be fine. College preparedness extends beyond basic skills in English and Math. Of course, these skills are critical for students' success. However, there are

equally central skills (e.g. persistence and planning) that many students do not have and do not receive enough practice in, to achieve understanding and mastery in an introductory Science class.

Fostering and encouraging an environment in which students can identify their struggles and begin to identify ways to meet their challenges allows them to begin to identify steps to improve. One technique I have employed in the past is to ask students to contact me (email or in person) to describe the method(s) they have used for studying (when a low score is earned) and then to identify new approaches that he or she may take when beginning the study of the next topics under discussion. I would like to extend this conversation beyond a one time event and beyond only with the instructor only in order to develop a dialogue between the struggling and not struggling students.
Teaching note taking and outlining, pairing students in Learning partnerships, and teaching students skills to monitor their own progress are potential ways to improve student success skills.

Kristina Obom
John Hopkins University, Rockville, MD

Assignment #1: Introductions

1) Describe your teaching responsibilities and the type of student you teach

Currently I teach master's students in the Johns Hopkins MS in cruelty and MS in Bioinformatics program both online and onsite. I teach three courses a year and spend the rest of my time in academic administration including advising, hiring faculty (the majority of our faculty are adjuncts), faculty development, program development, etc. Our students are primarily working adults, taking classes either online or at night. This semester I taught Emerging Infectious Diseases online -- always a dynamic course and our topic changed last week to address the swine flu epidemic. Next year, I will be co-teaching Cell Culture Methods which for the first time will have an online component, Biodefense Lab Methods, and probably pharmacogenomics in th spring, which will be a new course for me. In addition to teaching grad students I have collaborated with colleagues in the Dept of Biology on a Tech Fellow project. We received a small grant fro m the university to pay some undergraduate students to produce several videos that introduced students to various techniques in the lab. The purpose was to give students a visual introduction to procedures before stepping into the lab. We have submitted another application to expand on this project. We also hope to offer an intersession course in bioinformatics for undergrads this January.

2) Describe what you would like to take home as a result of attending the SoTL Institute

One of the issues we faced with the Tech Fellow project was finding the best way to assess the success (or failure) of using videos in the classroom. We used a PPI index but it was difficult to interpret. I would very much like to learn about the best methods for course assessment and perhaps program assessment including statistical measures. I am also anxious to learn from the other educators about new methods for content delivery and ways to determine the effectiveness of new teaching methods both online and onsite.

3) Tell us about your interests outside of the classroom and a book that you've read recently

As the mother of three children, most of my time outside the classroom seems to be "drive time". I very much enjoy my family and they are a prime interest. Personally, I have been a Girl Scout leader for 15 years and I direct a children's handchime choir. After a recent trip to San Francisco, I picked up Escape from Alcatraz. An interesting and sobering book as it describes incredible human cruelty as well as great ingenuity.

Assignment #2: Reflections

1) How would you describe your "research problem(s)" to the Research Scholars group?

My research problems are in two areas: the effectiveness of using video for laboratory preparation and second the introduction of a new teaching method for our program, problem based learning, into the online environment. In collaboration with

the Biology Dept at JHU, we have been awarded a Technology Fellowship from the Center for Educational Research to have undergrads develop technique videos that will supplement laboratory classes. The idea is to have students view the videos prior to class so they are prepared to perform the experiments for class. The research problem is to determine the effectiveness of this teaching tool, i.e. the "does it work" taxonomy. The second part of the question, is can we make this work better.

The second problem is the introduction of problem based learning into the online environment. Problem based learning has been used successfully in onsite biology courses at a number of universities including the U of Delaware. There isn't a lot of literature available about how to implement PBL into the online environment and even less literature on how to assess it. My preliminary attempts to use PBL have generally met with positive responses from students but I do not have a good method for assessing effectiveness.

2) What theme(s) based on your readings, resonate with your "problem" and/or your proposed approach to address your problem?
Several themes resonated with me. The first is that educational problems are complex and require more than one method for assessing effectiveness. Second is that the methodology for assessment may be out of my comfort zone. I am not as comfortable with qualitative research methods and so I don't implement them. Third, I don't often think about my teaching from the learner's perspective and that needs to change.

3) Based on Pat Hutchings article, what taxonomy would you use to describe your research question and why?
My research questions are all "does it work". The introduction of new technology and new pedagogy into the classroom is all about does it work. See question one for more information

4) Do you have any questions/concerns/comments that have evolved from your reading?
The readings were great food for thought and I look forward to discussing in more detail with my colleagues.

Assignment #4: Annotations

I have tried to introduce Problem base learning into my online Emerging Infectious Diseases course. I would like to determine if the learning is better and more in-depth and if so have some information to share with my faculty about the value of this type of pedagogy.

White, H. B. (1996). L. Richlin (Ed), Dan Tries Problem-Based Learning: A Case Study, *To Improve the Academy Vol.* 15 (pp. 75 - 91). Stillwater, OK: New Forums Press and the Professional and Organizational Network in Higher Education. http://www.udel.edu/pbl/dancase3.html

This paper first describes the history of Problem based learning, and then describes the implementation at University of Delaware. The paper than goes through an exercise using a case study of a professor, Dan, who tried PBL. It first describes his initial attempt, followed by questions about decision making,. The paper then

discusses formation of groups, the first class, student concerns, grading groups, the mid-term exam, final grades, grading the professor (ie what does the chairman think) and course evaluations. Each section is followed by questions for the reader to consider about the experience. This paper is helpful as it lays out what happens in a PBL environment and the problems associated with it. It provides some guidance for implementation and some parameters to consider for assessment and analysis.

ERIC #: ED502564
Title: Web-Based Evaluation System for a Problem-Based Laboratory
Authors: Azli, Naziha Ahmadi; Othman, Mohd Shahizan
Publication Date: 2008-03-00
Pub Types: Journal Articles; Reports - Descriptive
Journal Name: Online Submission
Journal Citation: U.S.-China Education Review v5 n3 p16-23 Mar 2008
Publisher:
Descriptors: Evaluation Criteria; Problem Solving; Laboratories; Evaluation Methods; Student Evaluation; Foreign Countries; Internet; Problem Based Learning; Engineering Education; College Students; Grading; Web Sites; Grades (Scholastic)
ERIC Full-Text:
http://www.eric.ed.gov/ERICWebPortal/contentdelivery/servlet/ERICServlet?accno=ED502564

This paper discusses the implementation of PBL in an Electrical Engineering Lab. 500 students from seven programs registered and were broken into groups of 4 or 5 to solve 3 problems. A team of the faculty members developed a five part evaluation for each lab. Several of the parts included rubrics. In order to automate the system a web interface was developed that limited access depending on the status of the individual (TA, student, faculty). The most useful part of this paper is the development of the assessment/grading piece. One of the most difficult parts of implementing PBL is finding appropriate methods of assessment. In this case, with 500 students to grade the problem in significantly compounded.

ERIC #: ED503394
Title: Faculty and Graduate Student PBL Experiences
Authors: McDonald, Betty
Publication Date: 2008-11-11
Pub Types: Reports - Evaluative
Journal Name: Online Submission
Journal Citation:
Publisher:
Descriptors: Problem Based Learning; Training; Graduate Students; College Faculty; Student Attitudes; Teacher Attitudes; Engineering Education
ERIC Full-Text:
http://www.eric.ed.gov/ERICWebPortal/contentdelivery/servlet/ERICServlet?accno=ED503394

This paper has an extensive literature review on PBL with many references. The study asked qualitative questions about student and faculty experiences with PBL who were part of an MS in Petroleum Engineering degree. The students were surveyed using an instrument that attempted to evaluate their feelings about PBL. Unfortunately, the surveys are not part of the paper. What this paper provides is a

great source of references but otherwise the study is poorly designed, there is no statistical analysis and I guess since it is not the US, an IRB exemption is not necessary. The biggest take home for me from this paper is to be careful about papers that are not peer-reviewed.

Hmelo-Silver, Cindy 2004 Problem-based learning: What and how do student learn? Educational Psychology Review16 (3) 325-365

This extensive review article first discusses the types of PBL and then goes into great depth about how the learning process works and the role of facilitator and student. She discusses the role of collaboration and reflection in the learning experience. There is an extensive review of the research on effectiveness of PBL as reported in peer-reviewed journals. There is a great section discussing how students become self-directed learners and how they become effective collaborators. Finally there is a section that discusses motivation. The discussion points out some of the limitations in the studies done thus far and the need to integrate some "just in time" teaching. This idea is absolutely contrary to Barrow's perspective. This paper is a foundation work that reviews much of the existing research and makes suggestions for further investigation.

Anderson, WL, SM Mitchell, MP Osgood, 2008 Gauging gaps in Student Problem-Solving Skills: Assessment of Individual and Group Use of Problem-Solving Strategies Using Online Discussions CBE—Life Sciences Education 7: 254 – 262

This paper discusses the use of PBL in a large Biochemistry class as a way to encourage small group discussion. The paper outlines a complex grading rubric and several metrics for determining success of the PBL exercise. The data analysis has some new presentation methods including a chart that used intensity of color to indicate success. This figure was a domains analysis and could provide a useful tool for assessing success. This paper uses bar graphs but there is no statistical analysis. The value of this paper is in the development of the grading rubric and analysis of PBL online. There is very little literature about using PBL online.