

## 2008 Table of Contents

<b>Name</b>		<b>Pages</b>
<b>List of Leahy Finalists</b>		
Alsardary, Salar	Interactive, Learning- Centered Methods of Teaching Mathematics Courses	02
Jonnalagadda, Sriramakamal	Restructuring of Instruction Delivery and Assessment in large classes	05
Wolbach, Kevin	Prescription Pads, A Tool for Student Success	08

<b><u>Featured Abstracts</u></b> <b><u>Alphabetical List by</u></b> <b><u>1st Author</u></b>	<b><u>Title of Educational Practices</u></b>	<b><u>Pages</u></b>
Alsardary, Salar	Interactive, Learning- Centered Methods of Teaching Mathematics	02
Aurora, Tarlok Singh	Assessing Problem Solving Skills with the Use of Self-Correcting Multiple-Choice and Diagnostic Examinations in Descriptive Astronomy	11
Bendl, Barbara	Pizza Lab Project	13
Brunner, Bernard J.	Newton's Third Law As A Vehicle for Promoting Critical Thinking	15
Cunliffe, Ping	Using Essays in Physics Exams- Enhancing Critical Thinking	18
Earl, Grace	Time-Lines Can Help Students Assess Patient Medical Problems in Clinical Case Studies	20
Flanagan, Anne Marie	Exercising Informed Judgment in "The Information Age"	24
Flanagan, Christine	The Experiential Text in General Education	26
Jonnalagadda, Sriramakamal	Restructuring of Instruction Delivery and Assessment in large classes	05
Kimchuk, Amy	Math Is the Word Changing Attitudes and Beliefs About Word Problems	29
Mahalingam, Madhu	Guided Inquiry in General Chemistry Laboratory	31
Pauley, David	Correcting Mistakes Thru Sandwiches	33
Porter, Jason A., Mostrom, Alison M., Agbada, Eva, Bowman, Leslie A, Purzycki, Catherine B. Wolbach, Kevin C.	Learning to SMILE: Developing First Year Students' Critical Thinking Skills using an Angel Based Scientific Method and Information Literacy Exercise	35

**Featured Abstracts**  
**Alphabetical List by**  
**1st Author (continued)**

**Title of Educational Practices**

**Pages**

Porter, Jason A.,  
Johnson, James R.

Assessing Risk: Promoting Critical Thinking in a  
Environmental Microbiology Course

38

Robinson, Linda A.

Teaching Ethics & Legal Constraints through  
The Use of Case Studies

41

Wolbach, Kevin

Prescription Pads, A Tool for Student Success

08

# **Teaching Critical Thinking/Problem Solving or Ethics**

## **At the University of the Sciences in Philadelphia**

**The Teaching and Learning Center of the University of the Sciences in Philadelphia is proud to produce the ninth annual document of educational abstracts. Previous editions of the Document of Innovations have been recognized as one of the best ways to know how faculty are teaching. This document contains abstracts of educational practices that work at USP. Also as in previous years we feature the finalists for the Patricia Leahy Award for Learning Innovations. Over the past few years, the quality of this award has greatly improved. Now many of the submissions reflect true Scholarship of Teaching and Learning. Some of these faculty are ready to submit or have already submitted their ideas to referred professional journals. Last year we instituted a new award, called the Educational Bright Idea Award. This year we are giving Bright Idea Awards for creative ways to teach critical thinking/problem solving or ethics.**

**The overall goal of this document is to improve teaching and learning. A compilation of all the teaching practices into a book allows others to learn about these ideas and adapt them. This document provides faculty ideas that have worked with our students.**

**This document is disseminated throughout the campus and to interested people outside the University to give increased recognition to individual faculty who strive to improve their teaching as well as others who enable students to learn more. Hopefully, this document will help faculty to collaborate on new ideas and will inspire others to try new methods to improve their teaching and learning.**

**All of the faculty welcome feedback on their ideas. If you use or adapt an innovation, please give the author credit and tell the original instructor how it worked.**

**To submit a description of an educational practice for next year's edition, please use the submission form in the back of this document. Please submit it electronically.**

**Phyllis Blumberg, Ph.D.  
Director of the Teaching and Learning Center  
May 2008**

## Leahy Finalist

**Title of Innovation: Interactive, Learning- Centered Methods of Teaching Mathematics**

**Name of Innovator: Salar Alsardary**

**Telephone Number: 215-596-8761 Email Address: [s.alsard@usip.edu](mailto:s.alsard@usip.edu)**

**Department: Mathematics, Physics and Statistics**

**Type of Students: Intended for Computer Science majors, minors and Mathematics minors**

**Type of course or activity where implemented: Required, Elective**

**Leahy Innovation Submission: Winner Of 2008 Leahy Award**

**Course or activity where implemented: Discrete Mathematics, MA 314**

### **Describe rationale or goals of innovative educational activity:**

This is a learner-centered upper-level mathematics course where the students present the material to the class instead of the instructor, and the students make presentations on applied topics at the regional MAA meeting. After take-home examinations the students can discuss their answers 1:1 with the instructor. The students liked the course format, although originally they felt apprehension about learning from each other and about doing presentations. The students learned the content of Discrete Mathematics as well or better than they did before the instructor implemented these methods. The students learned other trans-disciplinary skills such as how to give presentations, how to give feedback to their peers, how to learn from feedback, and to trust their peers. The instructor enjoyed the additional connect he had with the students and felt that both he and the students benefited from it. This course incorporates 15 components of learner-centered teaching.

### **Describe the innovation and its innovation:**

Our university does not have mathematics majors. At our institution, Discreet Mathematics is an upper level mathematics course for students who are taking a minor in mathematics or computer science or major in computer science. The class is always small with less than 20 students.

In other mathematics courses taught by this instructor, the students are more passive because the instructor does most of the work. This course is different from his other mathematics courses because the students are active learners and they are responsible for their own learning process. The instructor changed his role from being the main disseminator of information to one of facilitating students to teach and understand the information. The students present the material to each other, and have many opportunities to discuss the material with the instructor either in class or outside of class. This course uses different learner-centered activities that are consistent with the goals for the course including a student-faculty interactive presentation of content presentation in the class, homework, student presentations on an applied topic of their choice, and interactive, take-home examinations. The following paragraphs explain these separate components:

A student-faculty interactive presentation of content presentation

Homework

Projects

Examinations with an interactive component

**Describe any changes in the implementation:**

I have been using this method for nine semesters with only minor changes. I do not expect doing any major changes in the future.

**Describe outcomes, especially learning outcomes, and the implications of the innovation:**

1. The students liked the course format, although originally they felt apprehension about learning from each other and about doing presentations
2. The students learned the content of Discrete Mathematics as well or better than they did before the instructor implemented these methods
3. The students learned other trans-disciplinary skills such as how to give presentations, how to give feedback to their peers, how to learn from feedback, and to trust their peers
4. The instructor enjoyed the additional connect he had with the students and felt that both he and the students benefited from it. This course also incorporates many components of learner-centered teaching.
5. Sharpen the students mathematical communication skills because of the in class and at the EPADEL meeting presentations
6. Instills pride, self-confidence in the students after a successful presentation
7. Gain experience doing a professional presentation related to mathematics
8. Learn connection between Discrete Mathematics and their discipline.
9. Help students understand Mathematical reasoning in order to read, comprehend, and construct Mathematical arguments.

**Reflect on what is working and why it is working:**

For many years, I was presenting this course as lecture-based course, but after attending many workshops that was offered by the Teaching and Learning Center and reading the "Learner-Centered teaching" book by Dr. M. Weimer, I realized that it is the time for me to switch from lecture-based practice to an interactive learning-centered practice. The reason that this approach worked is that the students became self and life-long learners and they started to communicate mathematically better. The students commented that this approach was completely different than any other Mathematics courses they ever studied and they learned the material more effectively. Also they said that the course load in this course compared with a course in their major was significantly lower (please see appendix 6).

**Describe student reaction to the innovation:**

After initial discomfort, the students liked it.

**Will the innovation be sustained within the course? Yes, If Yes, will you do anything differently?**

I used to assign the sections that the students present randomly but if I teach the course next time, I will assign hard sections of the course to strong students and easy sections to weak students.

I used to give students the option to meet with me individually to ask any question about the section that they are presenting before presenting it to the class, but if I teach the course next time, I will make it mandatory to meet with me. I will assign long sections in the course to two different students to present in the class because it will be too much work for one student to present.

## **What advice would you give to other people adapting this innovation?**

It is easy for an instructor to take over, say too much when students are struggling. When students struggle, the instructor thinks this is not efficient and this is very time consuming. But allowing students to figure things out on their own it is an excellent way for them to learn better

Plan in advance what topics instructor should cover, what topics students should cover. Assign students to topics depending on their strengths..Importance of pre-presentation 1:1 meeting. These meetings help the student to make a better presentation a number of ways. They have to prepare in advance of the presentation date. The instructor can give feedback on the planned presentation. The instructor can show the student how to do the problems or clarify the content so the student can make a better presentation. The instructor knows in advance the students' ability to teach clearly.

## Leahy Finalist

**Title of Innovation: Restructuring of Instruction Delivery and Assessment in large classes**

**Name of Innovator: S. Jonnalagadda**

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**Department: Philadelphia College Of Pharmacy - Office Of The Dean**

**Type of Students: Fourth year Pharm.D. students**

**Type of course or activity where implemented: Required**

**Leahy Innovation Submission: Yes**

**Course or activity where implemented: PH 316**

### **Describe rationale or goals of innovative educational activity:**

PH 316 (formerly PH 306) is a large class consisting of about 260 students. Instruction for PH 306 consisted of 30-40 PowerPoint slides per lecture, all of which were placed on blackboard for continuous student access. There was no assigned text for the course. Instead, a list of 5-6 references was included in the syllabus. Assessment consisted of three examinations with about 50 multiple choice questions per exam. Student attendance in the class was low (about 10-40%), and student evaluations were rated at generally > 2.00. As the course coordinator and an instructor for two-thirds of the course, it was my perception that students lacked interest in the course, and practically never used the references, which in turn compromised student learning.

My overall goal was to reorganize my portion of PH 316 (formerly PH 306) with the following specific goals:

1. To improve the quality of instruction through student-centered delivery of instructional material,
2. To improve student interest and learning using correlations of science with real-life examples,
3. To provide formative and summative assessment to students during examinations.

### **Describe the innovation and its innovation:**

- 1) To improve the quality of instruction through student-centered delivery of instructional material:
  - a. Clear communication of instructor expectations to students: A specific one-page Objectives handout was provided to students for each examination. The handout had the title, "You should know/understand the following material for Exam --". The page consisted of very clear, measurable questions, that the student was required to ask himself/herself prior to that examination. For instance, "What is the mathematical expression for viscosity and fluidity? What are their units?"
  - b. Assigning a textbook: A specific text book was assigned to the course. Specific page numbers were provided as reading material to fulfill each of the objectives stated in the handout provided in class.
  - c. Instructional material: PowerPoint slides were removed as the instructional material for the course. Instead, the instructor used a writing pad placed on the document camera, and began by writing out a question listed in the Objectives handout. This was then addressed in detail, with several examples from real life (see innovation 2). Students were assured that the instructor would not move ahead with the material until all questions were answered. In return, the students were required not to talk or discuss among themselves.
  - d. A discussion forum was set up where students were encouraged to post an interesting article relating to the pharmaceuticals. All articles that were recent and had content related to the course would qualify for additional bonus points. These articles served as additional instructional material for the course (student understanding of this material was not assessed).
- 2) Although several examples were used in class, only three examples will be discussed here.  
Example 1: A surfactant is used to mix water and oil together to make emulsions. The surfactant can be water loving, or oil loving, and can therefore result in a O/W or W/O emulsion. A surfactant is

comparable to a Chinese-English language interpreter, who can help facilitate communication between monolingual Chinese and English speakers. The Interpreter can be of Chinese descent that learned English, or of English descent that learned Chinese.

Example 2: Molecules can diffuse through a hydrophobic membrane by passive diffusion, active transport, or through aqueous channels. Similarly, we can cross the Delaware river by swimming, using a boat, or a Bridge.

Example 3: Separation of molecules in a HPLC column is comparable to about 10,000 people who start together to run the Boston marathon, and then separate out based on speed.

To provide formative and summative assessment to students during examinations.

The mid-term examination was split into the following four sections: Memory and retention, Analysis and Comprehension, Numerical Ability, and Application/Case studies. Although all questions were multiple-choice, they were weighted differently based which section they belonged to. For example, a question in the Memory and retention section was worth 1.5 points each, whereas a question in the Application/Case studies was valued at 3 points each. While reporting results at the end of the examination, the means and standard deviations for each individual section was reported to each student to ensure formative assessment. For instance, students who claimed to have read the material over and over again but performed poorly on the exam, were found to have high scores in the memory section, but did poorly on the Analysis and Applications sections. In this manner, students can have access to specific feed-back regarding their performance. Specific recommendations were made by the instructor on that performance on each sections means, and what may be done to achieve excellence in each section. The final exam was also split into sections similar to that of the mid-term, and results reported to individual students to enable summative assessment.

#### **Describe any changes in the implementation:**

Not Applicable.

#### **Describe outcomes, especially learning outcomes, and the implications of the innovation:**

- 1) The initial reaction to taking off power-point slides was mixed. Students seemed to want that method of instruction, as it was easier on their part. The instructor asked the students to give this a chance and promised that if this method did not seem effective, he would revert back to slides. After about two weeks of instruction without power-point slides, students were polled (by paper ballot) their preference for a method of instruction. There was overwhelming support for the new method (without power-point slides).
- 2) Students appeared to like the examples (see student reaction).
- 3) Students also appreciated the new exam format. Student dissatisfaction was minimal (see student reaction). The outcomes for each section of the examination was along expected lines. For instance, the Memory and Numerical Ability section had the highest mean with minimal standard deviation, followed by the Analysis and Comprehensive section. The Applications/Case studies section had the lowest mean and highest standard deviation.

#### **Reflect on what is working and why it is working:**

The new approach seems to be working. The Student evaluations for the instructor have increased considerably (a grand mean of 1.56 for the fall 2006 PH 316 class in STC 145). For the year 2007, the Instructors average evaluation score beat the department, school, and University averages in not just the grand mean, but in every single category. Student attendance has been relatively high (40-80%). The instructor receives several appreciative e-mails from students, and practically no emails suggesting dissatisfaction. Student participation in the optional discussion forum has also been reasonable (20-40%). Finally, it is the instructor's perspective that students enjoy and improved educational experience as well as learning in this course as a result of these changes.

**Describe student reaction to the innovation:**

Student reaction can be described best in student's words, which were highly favorable.

**Will you implement this innovation in other courses? Yes****Describe the other courses:**

Graduate Courses (PH 880)

**What advice would you give to other people adapting this innovation?**

I feel any major change in the instruction or assessment strategies to a course need to incorporate student input.

**Additional Comments:**

There were three aspects of teaching covered in this submission.

- 1) Instructional Material and delivery: The instructor believes that individual faculty have to use whatever makes them feel most comfortable. However, they should be open to the fact that better methods will always exist.
- 2) The use of examples: The instructor has seen several faculty who seem to imply that it is primarily the student's responsibility to comprehend the material by reading references prior to class. While this may be true, the instructor believes that it is also the instructor's responsibility to present the material interesting and comprehensible, to ensure that lecture hour is of value to students.
- 3) The instructor believes that formative and summative assessments are no longer an option, and need to be implemented in some manner in all courses.

## Leahy Finalist

**Title of Innovation:** Prescription Pads, A Tool for Student Success

**Name of Innovator:** Kevin C. Wolbach

**Telephone Number:** 215- 895-3129 **Email Address:** [k.wolbach@usp.edu](mailto:k.wolbach@usp.edu)

**Department:** Biological Sciences

**Type of Students:** 1st Year Students

**Type of course or activity where implemented:** Required, Core Curriculum/General Education

**Leahy Innovation Submission:** Yes

**Course or activity where implemented:** General Biology I - BS103

### **Describe rationale or goals of innovative educational activity:**

I developed this approach after reading a report that our incoming freshman class spent less than 5 hours per week studying. This has led my determination to develop a mechanism for helping students understand what studying in a science course means and how they can attain better academic success. I also developed this as a mechanism to help students who seek advice on how to do better, after having poor performance on the first exam in the course.

### **Describe the innovation and its innovation:**

This innovation has multiple parts. The first part involves a change in the first day of class. I take the first 2 hours of class to talk about academic success. I first attempted this new course introduction in fall 2002.

I started out by introducing the students to the attitudes and attributes of learning that I was observing in my then 2 year old daughter. I realized that many of these could apply to first year college students. Things like repetition of material, seeking confirmation of understanding, not being afraid to play with ideas, sharing ideas with others, and having fun. I call it "What can a 2 year old teach college freshmen?"

From this point, I ask the students to group themselves in groups no larger than 4 and no smaller than 3. I give them three different questions to discuss in the group.

1) What is success? 2) How do you measure success? and 3) How do you achieve success? In this exercise, I want them to be thinking more widely about success.

I ask each group to have a scribe. I give them about 15 minutes to work on this activity and I walk around the room to make sure that they are on task. Then I ask the scribes to pass their notes to another student in their group and they are the ones that have to provide the answer to the first question. I record the answers on the board. Then that student passes the notes to another student in the group who answers the 2nd question. Again, I record their answers. The same thing takes place with the 3rd question.

After this discussion, I ask the students to look at their answers and ask them to consider how their answers would be different if the questions were related to academic success. I give them 10 minutes to discuss their revisions and we add or remove any items that require revision.

This discussion is followed by a presentation centered around a book entitled "The 100 Simple Secrets of Successful People And the Science Behind Them." by David

Niven, Ph.D.; I highlight about 25 of the most relevant items. I also discuss 11 traits from a book entitled "The Elements of Learning". Throughout this discussion, I am constantly reminding the students why this presentation is important; I want them to have success in their education.

From this point onward, I continue the course as normal; the introduction of the syllabus and the lectures leading to the first exam. After the first exam, I invite students who have had difficulty to meet with me. It is during this meeting that I begin the second part and most important part of the innovation.

The Prescription Pad was developed due to my previous experience with students who would come to office hours and not take notes. I put a simple card stock form together on which I write down specific notes for students. The session takes about 30 minutes to complete. During these sessions, I work on several key items. I first help the student identify their learning style. Then, I look at how they have prepared for the exam. I then examine what they do during the exam.

During the session, I begin to write notes on the Prescription Pad.

There are several standard items. First I show them how to manage their study time. I talk with them about reading the book three times, skimming the chapter before lecture, reading the chapter after lecture and then looking specifically at the figures. I also show them how to incorporate notes from the book into their lecture notes.

After that discussion, I show them how the ancillaries that are on Angel can assist their learning. I point them to the chapter objectives, animated activities, online labs and self quizzes. I give them a specific sequence in which to proceed through these activities.

The third level of activity is oriented to their test taking approach. I am a firm believer in students writing on their exams. I show them how to identify key words in the question, how to cross off wrong answers and how to define terms in both the questions and the answers. The final item is that they should put their answer back into the question. What I call the reality check. I provide them with a copy of the prescription for their advisor, one for themselves and I keep one for my records.

After doing this for about 2 years, I began to keep more accurate data about student performance.

### **Describe any changes in the implementation:**

Since the last collection of data, in the 5th year of this innovation, I have done more demonstration of the topics covered on the Prescription Pad in class. This has lowered the total number of students seeking personal advice on study skills. I have not been able to collect any data on specific groups of students.

### **Describe outcomes, especially learning outcomes, and the implications of the innovation:**

I now have 3 years worth of data that show a clear advantage for students who meet with me after the first exam. Those students, on average, have a final score that shows a 4.5 point gain above their average on the 1st exam, this is higher than any other group in the course. Those that see me after the 2nd exam have a decrease of approximately 0.25 points from their first exam to their final score and those not seeking any help show a decrease of approximately 0.75 points.

Due to the suggestion of a colleague, I decided to remove from the data the students who had an A or B or F on the first exam and focus only on those who had C's and D's. Those students that came to do the Prescription Pad after the first exam showed a gain of 4 points from first exam to final grade. Those who waited to see me until after the 2nd exam saw no gain or loss in their grades and those that did not chose to come see me saw only a 1 point increase in their final grade.

I believe that my research shows that the sooner a student seeks help from a faculty member in this biology course, the better the chance of their having academic success in the course. Those that wait until the second exam show no appreciable gain in performance in the course. It also shows that the types of advice and analysis that I do are leading to these gains in performance.

### **Reflect on what is working and why it is working:**

As the data indicate, students who seek help soon after the 1st exam have the greatest success rate with this innovation. I have not been able to tease out any particular suggestions given on the Prescription Pad that are working better than others. While I think that some students can see an improvement on scores by having this presented to the whole class, I think that most students only respond to the personal attention to their concerns in the one on one meeting.

**Describe student reaction to the innovation:**

Most students have been very appreciative of the guidance I've given. They seem most relieved to determine their learning style. For some, it is a confirmation and for others it is a revelation. Most students do seem to practice the suggestions given to them for more than just the next exam. Many students do come back after the initial meeting to review the techniques that I have suggested.

**Will the innovation be sustained within the course? Yes  
If Yes, will you do anything differently?**

I don't think that there will be that much that I would do differently. I would talk about the Prescription Pad and the suggestions the are contained on it to the whole class. But, I would still meet with students on an individual basis.

**Will you implement this innovation in other courses? No****What advice would you give to other people adapting this innovation?**

I think that this works best for freshman students only. Others adopting this innovation need to be most aware of the amount of time required to carry out the 30 minute sessions with each student. I am not sure how well this works without the individual sessions.

## Critical Thinking/Problem Solving or Ethics

### Critical Thinking/Problem Solving or Ethics of Practices: Assessing Problem Solving Skills with the Use of Self-Correcting Multiple-Choice and Diagnostic Examinations in Descriptive Astronomy

Name of Implementer: Tarlok S. Aurora

Discipline or type of course: Astronomy

Telephone Number: 215-596-8911 Email Address: [t.aurora@usp.edu](mailto:t.aurora@usp.edu)

Department: Mathematics, Physics and Statistics

Type of Students: All type

Level of students for which this practice can work: Any level

Type of Course or activity where implemented: Lecture, Lab

Size of class where this practice can be implemented: Any size

What resources do you use? Duplicate paper sheet (carbon copy type)

#### Describe the rationale or goals of the teaching approach:

- (1) To determine students knowledge of astronomy at the beginning of the course.
- (2) To determine how much students have learned without feedback from an open book.
- (3) To determine how students can improve their learning by getting feedback from a book.
- (4) To compare student performance on open/close book examinations, diagnostic test and course grade.

#### Describe the teaching approach:

Descriptive astronomy is as an elective course. It fulfills "multidisciplinary Inquiry" skill requirement of the general education curriculum at USP. Some of the topics covered are: astronomy in cultures through the ages, modern astronomy, the sky, seasons and climate, nature of light, properties of stars, birth and death of stars, origin of life on the Earth, search for extra terrestrial life, and social and moral issues related to space colonization versus preservation of the Earth. These topics are presented in a lecture and discussions format accompanied by reading assignments and problem solving. Students apply principles of physics and mathematics to analyze and solve quantitative and qualitative problems. Examples of these problems include formation of eclipses, phases of moon, retrograde motion, orbital motion of planets, seasons, nuclear fusion in stars, stellar temperatures, masses and distances. In some problems, students translate word problems into appropriate mathematical relationships using knowledge of mathematics and physics; and solve these equations for the desired quantity. Problem solving is done both in-class and in homework assignments. Other learning activities include the use of astronomy websites, and departmental telescopes to view the Sun and the night sky.

#### How do you assess that the students learned critical thinking or ethics?

The course grade is based on two in-class multiple choice examinations, an oral presentation, class participation and homework. Students are required to make a powerpoint presentation on an astronomy topic that incorporates at least one other discipline of knowledge (e.g. natural sciences, humanities, social sciences, etc). Written examinations contain both quantitative and qualitative problems, in the multiple choice format. With the open-book examinations, it was difficult to gauge how much the students had learned if they had not received the feedback from open books. Prior to fall 2007, there was no process present to learn how much the students knew about astronomy before taking the course. Such information would be useful for planning a teaching approach.

During fall 2007, the open-book examination approach was changed and, in addition, pre- and post-diagnostic examinations were administered. The homemade pre- and post-diagnostic tests incorporated concepts from the course and some general knowledge of astronomy. Comparison of post and pre-diagnostic test results showed an improvement in learning astronomy. The approach to open book multiple

choice examination was modified. In fall 2007, midterm examination was given in two steps. Step one: the students were asked to answer the questions without looking at lecture notes and book. They turned in their answer sheets to the instructor. They were allowed to keep a duplicate copy of their answers for comparison and/or correction during the latter part of the test. Step two: the students were asked to re-answer the same questions, now with open books. Students were allowed to change their previous responses or leave these unchanged. Correct answers on both attempts were given credit. This format of correcting answers is known as the Self-correcting Multiple choice (SCMC) examinations.

**Describe any student outcomes, especially learning outcomes, for critical thinking/problem solving or ethics:**

Most students showed improvement on test scores with the feedback received from open books. Student performance on SCMC examination, diagnostic examinations and the final course grade was compared. It was observed that students performing well on the post-diagnostic exam also performed better on the course grade. Course grades were higher than the post diagnostic test results due to class presentations. A student survey about the usefulness of SCMC examination approach showed an overall positive response toward SCMC. It was noticed that with the open-book-only examination, class grades were more skewed toward higher values. With the introduction of SCMC approach, the grade distribution was more symmetric about the mean.

**Describe the implications of using this approach:**

This approach can distinguish between students who have and those who have not acquired some basic knowledge of the subject with referencing a book. It also demonstrates how well students can use feedback to correct their errors.

**Reflect on what is working and why it is working:**

This approach is working because it is not completely closed-book. Students are not required to memorize large amounts of information. It provides an opportunity to improve their grades, while still working under the supervision of an instructor.

**Describe student reaction to the educational approach:**

Students preferred this approach to completely closed book examination.

**Will the practice be sustained within the course? Yes**

**Will you implement this teaching approach in other courses? Yes**

This approach is already implemented in a social science course (S. Moelter, TLC teaching day 2007). I will implement it in another small class setting too.

**What advice would you give to other people adapting this approach?**

Use duplicating paper similar to the one used by the registrar for grade reporting, so students can keep a copy of their responses.

**Do you want this abstract to be considered for a Bright Idea Award? Yes**

## Critical Thinking/Problem Solving or Ethics

### Critical Thinking/Problem Solving or Ethics of Practices: Pizza Lab Project

Name of Implementer: Barbara Bendl

Discipline or type of course: Calculus

Telephone Number: 215-895-1120 Email Address: [b.bendl@usp.edu](mailto:b.bendl@usp.edu)

Department: Mathematics, Physics and Statistics

Type of Students: Undergraduate

Level of students for which this practice can work: Any level, general education

Type of Course or activity where implemented: Lecture, Lab

Size of class where this practice can be implemented: Any size

What resources do you use? TI-84 calculator computer Word and MATLAB

### Describe the rationale or goals of the teaching approach:

The goals are to teach students the fundamentals of integration calculus and the proper use and limitations of technology. Students must be encouraged to “think outside the box” when faced with a problem they have not seen before.

### Describe the teaching approach:

1. Basic integration techniques are taught.
2. Students practice the techniques and do board work.
3. Integration is extended to apply to area of irregularly shaped regions.
4. Instructor models use of calculator and MATLAB to solve non-trivial integration area problems, illustrating the pitfalls and ways to surmount obstacles.
5. Students are given a two-part lab project to be completed in groups, culminating in a short written report of results. Part one is a problem that is similar to problems practiced and part two is a problem unfamiliar to the students, which requires them to reverse the processes learned in class.

### How do you assess that the students learned critical thinking or ethics?

Students will demonstrate that they have learned critical thinking by devising a solution process to the second project problem since it does not follow directly from class activities. The assessment will be their grade on the project, with higher grades indicating a correct solution process and a higher level of critical thinking.

### Describe any changes in the implementation since the first time you used it:

I have chosen harder examples to model the integration and area concept, especially problems that demonstrate the limitations of the technology, and I model ways to get around the problems. I have used the pizza problem before and I constantly update with different numbers and different cutting patterns.

### Describe any student outcomes, especially learning outcomes, for critical thinking/problem solving or ethics:

Students will work together to solve a non-trivial problem. Students will apply computational techniques learned in class. Students will demonstrate ability to use calculator and matlab program effectively and creatively. Students will demonstrate understanding of the concept of integration and area.

**Describe the implications of using this approach:**

Modeling critical thinking and problem solving behavior is something all instructors can do. Even making errors, something I do both consciously (to make a point) and unconsciously (sometimes mistakes just happen) models problem-solving behavior and empowers the students to "try" without thinking they have to have it figured out and perfect from the start. Critical thinking is best done without fear of making a mistake.

**Reflect on what is working and why it is working:**

This project works because it gets the students talking with their peers about integration calculus and area. These are like "critical thinking" think sessions.

**Describe student reaction to the educational approach:**

Although I get complaints about the project occurring late in the semester (due to when the integration and area topic is introduced and this cannot be changed), students generally get involved in the problem. I hear them talking about it and they get excited when they come up with a solution, especially if they used a different process than someone else (there are a number of "correct" ways to get to an answer for both parts of the project)

**Will the practice be sustained within the course? Yes**

I may try to come up with something else that can be divided up other than a pizza - but it would have to be something that students can relate to.

**Will you implement this teaching approach in other courses? Yes, Explain**

I am thinking about using something similar in MA101 - a group project that is not just a rehashing of class content but requires students to apply the class concept in a novel way. If I can design this type of project, I will also set up a class demonstration that will model the fundamental material in a non-fundamental way, involving technology and its limitations.

**What advice would you give to other people adapting this approach?**

Make mistakes - students are hard to convince that they can be problem-solvers and critical thinkers if they believe that they have to achieve a perfect solution process right from the start. Students need to see the "dirty" solution process, mistakes and all.

**Do you want this abstract to be considered for a Bright Idea Award? Yes**

## Critical Thinking/Problem Solving or Ethics

### Critical Thinking/Problem Solving or Ethics of Practices: Newton's Third Law As A Vehicle For Promoting Critical Thinking

**Name of Implementer:** Bernard J. Brunner

**Discipline or type of course:** Physics

**Telephone Number:** 215-596-8898 **Email Address:** [b.brunne@usp.edu](mailto:b.brunne@usp.edu)

**Department(s):** Mathematics, Physics and Statistics

**Type of Students:** Any Students

**Level of students for which this practice can work:** General education, Advanced undergraduate

**Type of Course or activity where implemented:** Lecture, Lab, Seminar/discussion

**Size of class where this practice can be implemented:** Any size

**What resources do you use?** Two student "volunteers", Force Plates interfaced with a laptop computer, Projection system, Individual Response Devices (clickers)

#### **Describe the rationale or goals of the teaching approach:**

Newton's Third Law of motion, sometimes stated in term of Action - Reaction pairs of forces, is widely misunderstood among students. They usually focus on an obvious effect and conclude that the forces are different. The goal is to begin to develop a connection between Newton's Third Law and its application in mechanics problems.

#### **Describe the teaching approach:**

After Newton's first and second laws are introduced and before the third law is introduced a demonstration is performed. A large male and a small female student are picked as 'volunteers' to participate in the demonstration divided into three scenarios. First, the students push against each other with neither moving. Next, the female student pushes against the male student and he moves backward at approximately a constant speed. Finally, the female student pushes against the male student and he moves backward with increasing speed. The class is then asked to compare the forces the students exert against each other and to choose from several choices: the female exerts the larger force; the male exerts the larger force; they exert equal forces on each other; or there is not enough information to decide. The vote by keypad was taken and displayed. This occurred at the end of class and the students were told to think about the demonstration over the weekend and we would continue the discussion on Monday. At the beginning of class the demonstration was reviewed and the students were to discuss their answers in their group and a second vote was taken on each of the scenarios. Finally the demonstration was repeated with each of the 'volunteers' holding a force plate with which they pushed against each other. The computer software recorded the force that each student exerted against the other and the graphs were projected onto the screen. This usually produces confusion since the results do not agree with their expectations. Newton's Third Law is presented and each situation is then analyzed using a free body diagram, with suggestions for forces acting taken from class responses. Later in the semester after Coulombs Law is presented in words and in formula, a situation involving the forces that two charged spheres, with one having twice as much charge as the other, exert on each other is presented in graphic form on the screen.

Six diagrams and a choice of none of the above are presented and the students register their choice using their keypads. The students discuss the situation and vote a second time. A hint to refer to the previous day's notes is given; students discuss the diagrams again and vote for a third time. Finally a hint is give to refer to Newton's Laws of motion, the question is again discussed in groups and a final vote is taken.

### **How do you assess that the students learned critical thinking or ethics?**

The first assessment is observing the changes in students' responses through the use of their keypads. An application of the Third Law is used again when discussing electrostatic forces and keypads are used again. Questions on Newton's Third Law are included on exams and the final.

### **Describe any changes in the implementation since the first time you used it:**

The first modification of the students pushing demonstration was made in fall 2006 when the force plate demonstration was first used.

### **Describe any student outcomes, especially learning outcomes, for critical thinking/problem solving or ethics:**

In the demonstration with students pushing there is a small shift toward the correct responses after discussion, but the majority are still choosing incorrect responses before the demonstration. With the diagrams of the unequally charged spheres, the majority choose wrong responses on the first vote. There is slight increase in correct responses after discussion, but the majority of responses are still incorrect. After the first hint, the percentage of correct responses increases considerably, but the majority of responses were still incorrect. After the second hint and additional discussion, a large percentage finally gave the correct response.

### **Describe the implications of using this approach:**

Multiple discussions of the two situations with appropriate hints supplied does increase the percentage of correct responses in the end. However, I am not satisfied with the lack of retention of material learned and the inability to transfer knowledge from the mechanics case to the electrostatic case.

### **Reflect on what is working and why it is working:**

Presenting students with situations which confront their misconceptions can lead to a better understanding of the physics involved. Students discussing their thoughts with other students can be an effective tool in developing understanding.

### **Describe student reaction to the educational approach:**

The students are very engaged and seem to respond well. A good number of students have asked follow up questions during and after the explanation of the observations in the demonstration with the two students. These two specific examples used here have not been mentioned in student evaluations, however.

### **Will the practice be sustained within the course? Yes, If yes, will you do anything differently?**

With the demonstration of students pushing against each other, I will have them read Newton's Third law after the first discussion and second vote. I will have them discuss the demonstrations once again before using the force plates in the demonstration.

### **Will you implement this teaching approach in other courses? Yes, Please Explain**

This can be used in any of the introductory physics courses.

### **What advice would you give to other people adapting this approach?**

Choose good questions which uncover student misconceptions.

**Do you want this abstract to be considered for a Bright Idea Award? Yes**

## Critical Thinking/Problem Solving or Ethics

### **Critical Thinking/Problem Solving or Ethics of Practices: Using Essays in Physics Exams-Enhancing Critical Thinking**

**Name of Implementer:** Ping Cunliffe

**Discipline or type of course:** Survey of Physics

**Telephone Number:** 215-596-8591 **Email Address:** [p.cunlif@usp.edu](mailto:p.cunlif@usp.edu)

**Department:** Mathematics, Physics and Statistics

**Type of Students:** second year students in PA, OT, PSY,PHMKT,MEDTC

**Level of students for which this practice can work:** General Education

**Type of Course or activity where implemented:** Lecture

**Size of class where this practice can be implemented:** 31-69

**What resources do you use?** None

#### **Describe the rationale or goals of the teaching approach:**

In an essay, students will explain and use in real life situations previously learned physics principles.

#### **Describe the teaching approach:**

There is one essay question on each exam. Students are required to answer it in a short essay form with the specific key word in it.

#### **How do you assess that the students learned critical thinking or ethics?**

Clarifying, accurate interpretations, and conveying in written form.

#### **Describe any changes in the implementation since the first time you used it:**

Make an essay question more specific.

#### **Describe any student outcomes, especially learning outcomes, for critical thinking/problem solving or ethics:**

The impact of critical thinking skills on students will be known in the long run.

#### **Describe the implications of using this approach:**

Anyone teaching courses in science can use it.

#### **Reflect on what is working and why it is working:**

I can't tell that in one semester.

#### **Describe student reaction to the educational approach:**

Students didn't like it at the beginning, now there used to it.

#### **Will the practice be sustained within the course? Yes, If Yes, will you do anything differently?**

No

**Will you implement this teaching approach in other courses? Yes, Please Explain**

Maybe, I will try it in lab.

**What advice would you give to other people adapting this approach?**

Be aware that it will take more time to grade exams.

**Do you want this abstract to be considered for a Bright Idea Award? Yes**

# Critical Thinking/Problem Solving or Ethics

## Critical Thinking/Problem Solving or Ethics of Practices: Time-Lines Can Help Students Assess Patient Medical Problems in Clinical Case Studies

**Name of Implementer:** Grace Earl

**Discipline or type of course:** This technique was used in PP557-8 Clinical Case Studies which is a required course in the Doctor of Pharmacy

**Telephone Number:** 215-596-8940 **Email Address:** [g.earl@usp.edu](mailto:g.earl@usp.edu)

**Department:** Department of Pharmacy Practice and Administration

**Type of Students:** Students in a health or pharmacy-related curriculum

**Level of students for which this practice can work:** Advanced undergraduate, Graduate/professional

**Type of Course or activity where implemented:** Field/clinic experience, Seminar/discussion

**Size of class where this practice can be implemented:** Less than 30

### What resources do you use?

Students in the third professional year of the Doctor of Pharmacy program solve a weekly patient case in PP557-8 Clinical Case Studies. The case is solved through application of the different therapeutic topics presented in PP551-4 Principles of Human Disorders and Pharmacotherapeutics and other courses. Students must arrive at the PP557-8 class having prepared a detail written care-plan and be prepared to discuss the case. The care-plan uses the SOAP format to organize information by stating any Subject or Objective data supporting the main problem; develop a concise and specific Assessment; and then develop a therapeutic and monitoring Plan. The enrollment in each section is 16 students and we discuss the case as a group, teams of 4, or pairs for 2 hours. During class, we also utilize the whiteboard to post problem lists, medication orders, and monitoring plans. The timeline is a visual tool that I can draw on the board to depict the events leading up to the patient seeking medical treatment at the current time. The use of this tool does not add to any preparation time.

### Describe the rationale or goals of the teaching approach:

The rationale of using a time-line is to clearly depict the progressive nature of human diseases, time-dependent risk factors, or factors related to the locale. In the course, students can use the time-line to enhance their ability to identify and solve therapeutic problems using simulated cases based on ambulatory or hospitalized patients experiencing exacerbations of their medical or drug-related problems.

### Describe the teaching approach:

Students work alone or in teams to analyze the case by sorting, organizing, and assessing patient-specific data. To develop a sophisticated problem list, the problem is clearly stated using qualifying terms as well as the appropriate disease staging. For example, "melancholic depression" would be more specific than "depression." In evaluating a patient who is overweight, identifying the appropriate stage (ex. Stage I for a body mass index 30 - 35 kg/m<sup>2</sup>) is important because published obesity guidelines will recommend specific drugs based on the stage. In addition, any active medical problems are categorized as either acute or chronic problem. Other factors that are considered before assessing the severity are: what is the etiology of the problem (could it be due to an adverse drug reaction or a complication of another diagnosis); is the patient experiencing symptoms; does the patient have end organ damage such as renal or hepatic disease; and is the problem controlled with the current drug therapy or uncontrolled. Once the major problem is identified, students make global assessments as to whether the problem is mild, moderate, or severe. Accurate and comprehensive problem identification is extremely important because the treatment plan will stem directly from the elements identified from the problem identified and corresponding assessment. Here

are a number of examples on how timelines can enhance learning. 1. To illustrate the course of the disease process and to identify any time-dependent risk factors. For infections, use the timeline to depict any surgery or invasive interventions occurring in the past. Clearly delineate the timeframe from the initial intervention to the current visit so the students can see whether it is in days, weeks, months, or years. For bacterial endocarditis, infections arising the first year after cardiac valve replacement are typically caused by *Staphylococcus* sp. whereas as after 1 year they are caused by *Streptococcus* species. The empiric antibiotic choices would be different in during year 1 or thereafter. For infections, use the timeline to depict the patient's course of symptoms. This can be used to distinguish between a community and hospital-acquired infection; these settings will directly influence the selection of the most appropriate anti-infective agent. 2. To illustrate staging or classification of the disease state and reinforces guidelines that delineate specific therapies. Use the patient's symptoms and activity level in the case to depict changes in the patient's disease. In heart failure, the timeline can depict whether the patient has been a stable New York Heart Association class II patient, or if their course has fluctuated with more unstable stages (Class III or IV). In this scenario, patients in Class III or IV should receive additional medication therapy (aldosterone antagonists or nitrates/hydralazine). 3. Using diagrams to illustrate the spectrum of a particular disease state. Reinforce whether the patient is in an early stage or progressive state. Distinguish acute from chronic status. Using the medical problem list (type 2 diabetes, episodes of Hyperosmotic Hyperglycemic Non-ketotic Acidosis - HHNK, presence of micro- or macrovascular disease) and laboratory data (Hemoglobin A1C and glucose) you can depict whether the patient is in the early or progressive stages of diabetes. Treatment will differ substantially whether you are treating chronic type 2 diabetes or acute HHNK. In addition, the treatment changes when you need to add preventative therapies in the presence of microvascular disease such as microalbuminuria. The timeline can be helpful to instruct students on the complicated concept of "acute on chronic" disease presentations. For example, the patient may have been diagnosed with acute HHNK and require insulin infusions at present. However, the student does need to address the chronic type 2 diabetes by developing a drug therapy plan addressing the needs following stabilization from their acute illness.

### **How do you assess that the students learned critical thinking or ethics?**

The students are graded based on their ability to correctly assess and identify problems and develop an accurate and appropriate plan. During class time, use of the timeline tool gives the students an opportunity to compare and contrast their assessments and drug therapy plans. The students can self-assess their plans and share their thought processes and critical thinking skills with their peers. The faculty member is available to answer questions and explain the basis for the correct answers.

### **Describe any changes in the implementation since the first time you used it:**

I had always put the timelines on the board based on the input from the students. However, at the end of the semester, I directed the students to put their own timelines up. In the future, I would have multiple groups develop their timelines and then share the results with the entire class. I would also integrate this tool in delivering a lecture on a therapeutic topic.

### **Describe any student outcomes, especially learning outcomes, for critical thinking/problem solving or ethics:**

A sample of written care-plans from one section enrolling 16 students was evaluated. In this evaluation, 7 cases submitted by a team of 4 students and 2 cases submitted by each individual student were evaluated in a section offered in the Spring 2008 semester. The assessments for the primary problem only were included in this evaluation. The percentages of correct problem assessments were tabulated for 9 of the weekly written care-plans (out of a total of 14 weeks). The instructor key was used as a reference. The students' assessments were deemed correct if they agreed with the key for the following: stating the primary problem with correct qualifiers or staging; identifying if problem was symptomatic; treated or untreated; acute or chronic; and severity (mild, moderate, or severe). The summative results are stated as the average percentage from each category that was in agreement with the instructor key: Weeks 3, 4, 6 and 7 (3 team

and 1 Individual Case) Problem identification: 100% Symptoms present: 89% Treated or untreated: 66% Acute vs. chronic: 54% Severity: 61% Weeks 10, 11, 12 and 13 (3 Team and 1 Individual Case) Problem identification: 100% Symptoms present: 80% Treated or untreated: 52% Acute vs. chronic: 89% Severity: 28% Team Cases at week 14 Problem identification: 100% Symptoms present: 75% Treated or untreated: 100% Acute vs. chronic: 75% Severity: 0% In one case, the patient had significant end organ damage and there was 65% agreement with the key for including this in the assessment.

### **Describe the implications of using this approach:**

Based on this sample, students were able to understand the acute and chronic nature of diseases but did not have sustained improvement in assessing problem severity. The "average percent agreement with the key" for acute vs. chronic was 54% at weeks 3 to 7 and improved to 89% at weeks 10 to 13. However, the ability to assess the severity of the problem decreased from 61% at weeks 3-7 to 28% at weeks 10-13. When evaluating the last team case at week 14, the teams had sustained improvement for assessing the acuteness of the problem (75%) however they did poorly on assessing the problem severity (0%). These data reflect a critical flaw in their ability to assess a problem which can dramatically affect their therapeutic reasoning abilities. One factor that may also impact these results is that students were presented with cases that covered a new therapeutic topic each week. They may have had difficulty with comprehending the new material.

### **Reflect on what is working and why it is working:**

It is a great tool because students can begin to see how the location of the patient can influence their risks for infections; how drug choices can change based on a stable or unstable patient; and how preventative drug therapy may be needed for patients exhibiting early stages of progressive diseases.

### **Describe student reaction to the educational approach:**

I administered a survey to the students during the last class and all 16 students agreed that the timelines were helpful. Using a Likert scale, 16 students responded to each statement. The Likert scale was: 1 - strongly disagree; 2 - disagree; 3 - neutral; 4 - agree; 5 - strongly agree. Their mean responses with the 95% confidence interval are listed below for each question. 1) The timelines helped me differentiate the risks for an infection occurring immediately after valve surgery versus an infection occurring > 1 year after surgery. Mean score 4.5 (95% CI 4.08-4.91). 2) The timelines helped me differentiate the risk of opioid tolerance in a cancer patient receiving chronic opioids for pain management versus a patient that was opioid-naive. Mean score 4 (95%CI 3.53-4.46). 3) The timelines helped me differentiate the infection risk for a patient developing an infection in the community versus one developing in the hospital. Mean score 4.5 (95% CI 4.11-4.88) 4) the timelines helped me understand the way to develop a new chemotherapy regimen for recurrent metastatic breast cancer in a patient who had already received prior chemotherapy. Mean score 4.5 (95%CI 4.25-4.74)

### **Will the practice be sustained within the course? Yes, If Yes, will you do anything differently?**

I would engage each student group in developing their own timelines and lead a discussion on the course of the disease and also identify any changes in treatment that may influence the current problem assessment and drug therapy plan.

### **Will you implement this teaching approach in other courses? Yes, Please Explain**

Yes, this tool can be utilized in delivery of lecture material and assist in instructing students on developing their therapeutic reasoning abilities.

**What advice would you give to other people adapting this approach?**

I would have the students share their timelines with each other as a form of peer assessment. Many times I saw that students suddenly became aware of the global perspective of the problem using the tool. I think the students will embrace it welcomingly as a useful visual learning tool.

**Do you want this abstract to be considered for a Bright Idea Award? Yes**

## Critical Thinking/Problem Solving or Ethics

**Critical Thinking/Problem Solving or Ethics of Practices: Exercising Informed Judgment in "The Information Age"**

**Name of Implementer:** Anne Marie Flanagan

**Discipline or type of course:** Intellectual Heritage

**Telephone Number:** 215-895-1132 **Email Address:** [a.flanag@usp.edu](mailto:a.flanag@usp.edu)

**Department:** Humanities

**Type of Students:** Undergraduates or Graduate Students

**Level of students for which this practice can work:** Any level

**Type of Course or activity where implemented:** Lecture, Seminar/discussion

**Size of class where this practice can be implemented:** Less than 30

**What resources do you use?** Intellectual Heritage Reader

**Describe the rationale or goals of the teaching approach:**

To help students make informed judgments in an age that features a wealth of information but not necessarily critical thinking or reflection.

**Describe the teaching approach:**

In the sixteenth and seventeenth century, Francis Bacon wrote about a new method by which we could rid our minds of attitudes that cloud our perception and understanding. In class, we use that new method to consider current events. We follow Bacon's advice and take "all knowledge to be our province." We have attempted to make informed judgments about the war in Iraq, weapons of mass destruction, and the attack on the World Trade Center on 9/11.

**How do you assess that the students learned critical thinking or ethics?**

I judge the thoroughness of their written responses. Have they challenged the weight of received opinion? Have they found evidence to support their claims? Have they set aside preconceived notions? Have they been willing to revise their claims and accept that ideas are always provisional, subject to constant revision?

**Describe any changes in the implementation since the first time you used it:**

No changes.

**Describe any student outcomes, especially learning outcomes, for critical thinking/problem solving or ethics:**

Students will, follow Bacon's advice, be open to all that they see and carefully examine all that they think they see.

**Describe the implications of using this approach:**

Students develop the ability to examine, analyze, and reflect. They are less apt to accept ideas, words, or events at face value. They question what they learn and experience.

**Reflect on what is working and why it is working:**

This approach works mainly because Francis Bacon was a prominent figure in the Scientific Revolution. He was not a scientist, but he did embrace new ideas and sought to find ways to help the public understand these ideas. He was, in many ways, a propagandist for science. This appeals to our students.

**Describe student reaction to the educational approach:**

This is not easy for students, but it is worth the effort. In Bacon's time, theologians, both Catholic and Protestant, objected to the study of physics and astronomy "as tending to pry into God's secrets," rendering curiosity a "pejorative word." Students have to overcome the tendency to accept, without question, what teachers, politicians, or their textbooks tell them is true.

**Will the practice be sustained within the course? No**

**Will you implement this teaching approach in other courses? No Please Explain**

Intellectual Heritage is especially suited to this kind of critical thinking. It provides students with knowledge from the past and demonstrates how the past informs the present.

**What advice would you give to other people adapting this approach?**

Be aware that as a teacher you may be looking through your own "false mirror," as Bacon terms it. You must be as reflective as your students and suspend judgment until you are fully informed. You must think critically as well.

**Do you want this abstract to be considered for a Bright Idea Award? Yes**

## Critical Thinking/Problem Solving or Ethics

**Critical Thinking/Problem Solving or Ethics of Practices: The Experiential Text in General Education**

**Name of Implementer: Christine Flanagan**

**Discipline or type of course: IH 212 Intellectual Heritage-Nature**

**Telephone Number: 215-596-543 Email Address: [c.flanag@usip.edu](mailto:c.flanag@usip.edu)**

**Department: Humanities**

**Type of Students: All**

**Level of students for which this practice can work: Any level**

**Type of Course or activity where implemented: Lecture, Service learning, Seminar/discussion**

**Size of class where this practice can be implemented: Less than 30**

**What resources do you use? Methods of transport are the key resource needed.**

### **Describe the rationale or goals of the teaching approach:**

The goal of an Experiential Text is to deepen a student's comprehension of traditional (text-based) course material. In the health sciences, clinical rotations and labs are an essential component of understanding and applying course material; an Experiential Text serves in the same way in a general humanities course.

### **Describe the teaching approach:**

Since an Experiential Text is not a clinical rotation or lab (as we see in the health sciences), the Experiential Text assignment first must distinguish itself from a "field trip." When a student in a general humanities class hears the term "field trip", here are two typical responses: "Great: we get out of the usual boring class." "Oh, no: the teacher is forcing me to visit a place I never wanted to go." An experiential text, I tell students, is not merely a field trip. In an experiential text, we treat the experience (excursion) as we would treat a text: with rigor, curiosity, and-hopefully-the joy of intellectual discovery. We prepare for the text, we immerse ourselves in the text, we ask critical questions, and we consider the implications of the text. One course where I use the Experiential Text assignment is in my summer Intellectual Heritage-Nature course. Students in the course travel with me to the Southwest United States, where we visit Zion National Park, Bryce Canyon National Park, the Grand Canyon, the Dixie National Forest, the Hoover Dam, and Las Vegas. After a week of travel, we return to campus to continue class as a traditional (text-based) humanities course. The Experiential Text assignments are many and varied, but all share the qualities of academic investigation we would apply to traditional text. For example: I ask students to note what they do not understand and "look it up" (find the answer), much the way they would when encountering an unfamiliar allusion in a text. Their daily (often hourly) observations are recorded in journals (similar to taking notes in class), and they return to these observations and expand them after class discussion. Students are asked to connect observations from the Experiential Text with the traditional course ("The Cherokee creation story describes how the world was created; how do you see this reflected in the landscape we see at the Grand Canyon? How do the Cherokee stories affect the management of the land?") The collision of experience and ideas invigorates a student's understanding of the course texts.

### **How do you assess that the students learned critical thinking or ethics?**

Since my courses are Humanities courses, I assess critical thinking in the form of writing assignments (essay exams, travel journals, and papers). Ethics is not a defined part of the IH Nature course outcomes. However, I do assess critical thinking, and understanding ethics is a reflection of a student's ability to think critically. Throughout the course we explore choices made by humans and the consequences of these choices. If you are to understand the choices and consequences, you must understand the value systems that shape both the choices and our assessment of the consequences. A writing assignment might discuss, for example, why the Hoover Dam was built. Who determined that one thing (producing power for humans) was more important than another (altering nature)? What are the positive and negative consequences of constructing the Hoover Dam? Should we construct another similar dam in the future? In the writings for IH

Nature, I ask students generally to present an original argument based on their comparison of the experiential texts to the traditional (book) texts. This assignment forces them to evaluate single experiences and texts, compare and contrast them, and articulate their own ethical standpoint about some issue of nature. Understanding connections will illustrate critical thinking, but will also inevitably allow students to discuss ethical decision making in the environmental arena. Future (2008-2009) courses will include surveys of student perceptions and attitudes about how they learned critical thinking and ethics.

**Describe any changes in the implementation since the first time you used it:**

I've changed too many details to remember them all.

**Describe any student outcomes, especially learning outcomes, for critical thinking/problem solving or ethics:**

Students gain a deeper understanding of environmental issues and related issues (politics, economics, etc.). Students understand how traditional (book) texts are relevant today (how are Malthus' ideas on population relevant when you consider the environmental problems in Las Vegas?)

**Describe the implications of using this approach:**

At a university that prepares students for careers in the health sciences, experiential and clinical education is understood as necessary. Doesn't it make sense that using experiential texts in the Humanities and writing classrooms would expand their learning in a similar manner? Teaching with the Experiential Text is a great opportunity for expanded learning. Students whose primary question is Why do I need this course? have that question answered. In fact, when I teach using an experiential text, students don't ask that question at all. Finally, one of my primary goals is to show students that academic investigation can be enjoyable. Once they see how an Experiential Text works, they can immerse themselves in their own explorations, whether or not they are led by a faculty member.

**Reflect on what is working and why it is working:**

Experiential texts bring joy to reading traditional texts-and experiential texts add depth to this reading and comprehension ("When Emerson writes about how beauty spurs the intellect, it reminded me of the Grand Canyon. The stunning red rocks made me want to learn more about geology.") Experiential texts demolish the artifice of classroom walls, illustrating that learning is everywhere; at the same time, traditional texts provide understanding that "textbook learning" is necessary. Thus, through teaching experiential texts, students gain an understanding of the concept of paradox.

Experiential texts make abstract ideas (Bacon's early scientific method; Malthus' discussion on perfectibility; Parson's definition of technology) concrete and relevant (imagine the ethical questions and critical thinking about nature and technology after touring the Hoover Dam!) Experiential texts allow us to question widely accepted ideas (anthropocentric views; separation of humans from nature) while traditional texts provide alternate, fully articulated ideas that echo our questions (Thomas Palmer's The Case for Humans; Egyptian and Cherokee creation stories)

**Describe student reaction to the educational approach:**

For the summer IH Nature class, students have enthusiastically signed up for a week-long field trip through the Southwest US; they don't much think (ahead of time) that this will be a learning experience. At weeks end-after we have completed a sequence of traditional text readings during our travels-they are bursting with enthusiasm about their knowledge. One heartless professor (me) gives the class' first exam (an essay question photocopied at Bally's Las Vegas) on the plane flight back to Philadelphia. The exam is open book and notebook (they have kept a travel journal), and the exam is due before they exit the plane in Philadelphia. I tell them the exam is designed as a standard one-hour exam. One year, we were delayed at

our connecting flight-Chicago, I think. Students were spaced around the airport, scribbling furiously. The student who wrote the shortest essay wrote for three hours. One wrote for nearly five hours-there was so much to say, she told me later, so many ideas. (A part of me was secretly thrilled; the guilty part of me has since designed a more focused exam question and determined that direct flights are necessary.) I now tell students that while they can use as much time as they need between Las Vegas and Philadelphia, there is a seriously good in-flight movie on the plane and they should limit their essay's thesis. I remind them, also, that they will have the opportunity to write a paper back at home that expands on all they saw and encountered. There are various reactions when I teach experiential texts. Some students want to sit in the classroom, hear a lecture, and be told what material they should study and memorize for an exam. Some students are resistant because they have legitimately busy schedules. Most love the idea of "getting out of the classroom"-but that is because they equate "field trip" with "nonsense." So, when they see that the "field trip" is something that requires activity and thought on their part, there is a second wave of resistance. I typically ignore all these forms of resistance. When you lead with determination and authority, students will follow. And when you allow room for fun to occur while they learn, they are eager for the next Experiential Text assignment. A side note: Within the excursion, the Experiential Text assignments will have many specific activities (too numerous to list here) that provide structure to their exploration. Instead of wandering through a landscape, they are given achievable goals (sometimes I call them scavenger hunts to emphasize that they enjoy while exploring). They leave an experiential text with a mind full of images and questions, and a notebook full of details and descriptions that they can use in their writing and thinking later.

**Will the practice be sustained within the course? Yes**

I always adapt the Experiential Text to best serve whatever location we're visiting.

**Will you implement this teaching approach in other courses? Yes Explain**

My EN 101 and EN 102 classes interview neighborhood residents in an oral history project--also an experiential text assignment.

**What advice would you give to other people adapting this approach?**

Use the experiences you have enjoyed and share them with your students! There are opportunities for all faculty members to design travel study and study abroad courses; or, you may want to simply attempt a day-long excursion at first.

**Do you want this abstract to be considered for a Bright Idea Award? Yes**

## **Critical Thinking/Problem Solving or Ethics**

### **Critical Thinking/Problem Solving or Ethics of Practices: Math Is the Word Changing Attitudes and Beliefs About Word Problems**

**Name of Implementer:** Amy Kimchuk

**Discipline or type of course:** PRE-CALCULUS/CALCULUS

**Telephone Number:** 215-596-8705 **Email Address:** [a.kimchu@usp.edu](mailto:a.kimchu@usp.edu)

**Department:** Mathematics, Physics, and Statistics

**Type of Students:** Undergraduates

**Level of students for which this practice can work:** General education

**Type of Course or activity where implemented:** Lecture, Lab

**Size of class where this practice can be implemented:** 31 – 69

**What resources do you use?** TI Calculators

### **Describe the rationale or goals of the teaching approach**

A number of students come to college unable to do word problems and are filled with negative attitudes about them. Students go out of their way to avoid word problems at all costs. My goal is to alleviate the anxiety or stress students have when faced with any word problem.

### **Describe the teaching approach:**

1. Break down negative beliefs by providing a positive, supportive, can-do environment in math class
2. Motivate students to come to class with an open mind and a positive attitude.
3. Introduce clear techniques for solving word problems, and provide examples.
4. Use class time to work collaboratively, and have students share their results on the board and explain their solutions.
5. Continually reinforce word problems in both the Fall and Spring semesters.

### **How do you assess that the students learned critical thinking or ethics?**

1. Three word problem projects each semester in which students work in pairs to set up, solve, and write a report about their work and solutions.
2. Word problems on quizzes and tests, including the Final Exam.
3. Teacher Evaluation Forms (comments are made most semesters about how the word problem activities have changed their attitudes and beliefs)

### **Describe any changes in the implementation since the first time you used it:**

When I first began this activity, I only allowed for one or two class hours. Now, I try to do group work with word problems after every important concept.

### **Describe any student outcomes, especially learning outcomes, for critical thinking/problem solving or ethics:**

Students will understand the importance of solving a word problem. Students will work together to set up and solve a word problem. Students will be able to critically examine information and demonstrate problem solving skills. Students will be able to understand and solve multidisciplinary application problems.

**Describe the implications of using this approach:**

Students begin to appreciate word problems (though they may not necessarily "like them"). Once students understand how to set up word problems their attitudes and beliefs change, and they begin to see the connections in other disciplines.

**Reflect on what is working and why it is working:**

These activities work because of the relaxed atmosphere. Students ask more questions when they are working together and it allows them to learn from their peers.

**Describe student reaction to the educational approach:**

Students appreciate the time given during class to work together in understanding mathematical concepts. They participate more in class by volunteering to go to the board and show their work.

**Will the practice be sustained within the course? Yes**

Not as of yet.

**Will you implement this teaching approach in other courses? No, Explain**

While I have used group work in my advance courses to assist students in understanding mathematical concepts, I do not specifically focus on word problems.

**What advice would you give to other people adapting this approach?**

Understand that some students can solve an equation when given one, but have trouble setting up a problem. Make time in class for group activities as a learning process.

**Do you want this abstract to be considered for a Bright Idea Award? Yes**

## Critical Thinking/Problem Solving or Ethics

### Critical Thinking/Problem Solving or Ethics of Practices: Guided Inquiry in General Chemistry Laboratory

Name of Implementer: Madhu Mahalingam

Discipline or type of course: Chemistry

Telephone Number: 215-596-7549 Email Address: [m.mahali@usp.edu](mailto:m.mahali@usp.edu)

Department: Chemistry & Biochemistry

Type of Students: Undergraduate

Level of students for which this practice can work: General education, Advanced undergraduate

Type of Course or activity where implemented: Lecture, Lab

Size of class where this practice can be implemented: 31 – 69

#### What resources do you use?

I use a guided inquiry modular experiment from Brooks-Cole publishing and supplement it with my own guided inquiry worksheet that students fill out in small groups in lab.

#### Describe the rationale or goals of the teaching approach:

Students often lose interest in lab because they do not understand why they adopt a certain procedure and how the experimental data connects with the concepts they are learning. In addition in a traditional verification lab as they follow a set procedure, they are not using their critical thinking skills and get bored as they are mechanically following a procedure. This leads to complaints about workload for a 1 credit lab since the effort it seems to require seems a lot because they are not fully engaged in the process.

#### Describe the teaching approach:

Students are expected to research the background for the lab through pre-lab questions. In lab, students are then given a guided inquiry worksheet and a list of materials and equipment that they can use to achieve their objectives for the experiment. Students work in groups to answer questions in the guided inquiry worksheet which then leads them to the experimental procedure they need to adopt to achieve the objectives. Students then come up with a flowchart that outlines the procedure that they plan to use for the experiment.

#### How do you assess that the students learned critical thinking or ethics?

These are assessed based on the procedures developed by the students as well as the post-lab questions that students are expected to answer.

#### Describe any changes in the implementation since the first time you used it:

Since I am trying this out in a multisection lab course which I coordinate, any changes made are to streamline the implementation so that all the students taught by different instructors are presented with the same approach. Effective implementation in all of the sections (18 sections) of the lab is a challenge. I present the approach and how to implement it effectively, to faculty and staff teaching the labs a week prior to lab

**Describe any student outcomes, especially learning outcomes, for critical thinking/problem solving or ethics:**

Students are actively engaged in the lab thinking about the procedure and how it relates to the concepts rather than mechanically following a written procedure. This improves their understanding of the lab as well as keeps them interested in the lab. As they develop their procedures, they think about the efficacy of the procedure and the possible sources of error in the procedure. They also understand the calculations that they need to carry out at the end of the experiment better.

**Describe the implications of using this approach:**

The guided nature of the approach provides students with a framework within which they develop their own procedures. So all students are able to participate meaningfully and grasp the ideas. The process of developing a procedure to achieve the objectives helps them connect the concepts involved to the procedure. This improves their understanding of the lab.

**Reflect on what is working and why it is working:**

The process of developing their own procedure is new to the students and since it is collaborative in nature, it becomes a fun activity. Thinking about the procedure more meaningfully helps students understand the concepts better.

**Describe student reaction to the educational approach:**

Student reaction has been mostly positive. Students end up doing more work for the lab and do not realize that. Students generally appreciate the lab as it engages them in ways that other labs that require following a set procedure do not.

**Will the practice be sustained within the course? Yes, will you do anything differently?**

The basic framework will remain the same. The guided inquiry worksheet can be improved further. Also, I have students working in groups of 6 to develop the procedure. Next year, I plan to reduce that to groups of 4 students. Currently I have developed only one experiment along this model. I plan to introduce more as I work out the details for the current experiment.

**Will you implement this teaching approach in other courses? No, Please Explain**

The only other course I teach is General Chemistry lecture where we adopted a group problem solving approach in recitation to improve problem solving skills.

**What advice would you give to other people adapting this approach?**

A lot of thought needs to go into developing the guided inquiry worksheets. The questions should be framed in order to lead the students to the next step in the process.

**Do you want this abstract to be considered for a Bright Idea Award? Yes**

## Critical Thinking/Problem Solving or Ethics

### Critical Thinking/Problem Solving or Ethics of Practices: Correcting Mistakes Thru Sandwiches

Name of Implementer: David Pauley

Discipline or type of course: Athletics

Telephone Number: 215-596-8817 Email Address: [d.pauley@usp.edu](mailto:d.pauley@usp.edu)

Department: Athletics/Physical Education

Type of Students: ALL

Level of students for which this practice can work: Any Level

Type of Course or activity where implemented: Lecture, Lab, Service learning, Field/clinic experience, Seminar/discussion

Size of class where this practice can be implemented: Any size

What resources do you use? Men's Basketball Players (12)

#### Describe the rationale or goals of the teaching approach:

The goal is to correct errors:

- break down the subject matter into smaller parts.
- relate the smaller part's relation to the whole concept.
- always explain the "why" of a certain technique.
- if the students understand the "why" - they have a better chance of learning the information.

#### Describe the teaching approach:

It Is Very Simple Technique.

- The Teacher Sees An Error.
- The Teacher Demonstrates The Correct Method.
- The Teacher Then Demonstrates The Student's Error.
- The Teacher Then Shows The Correct Method Again.

This "Sandwich" Effect (Positive-Negative-Positive) can be used in a variety of settings.

#### How do you assess that the students learned critical thinking or ethics?

Using Game And Practice Statistics Can Give Feedback If The Technique Was Mastered. Video Filming Of Games Also Gives A Visual Re-Enforcement Of Techniques Mastered.

#### Describe any changes in the implementation since the first time you used it:

It keeps me focused on the overall goals and objectives.

#### Describe any student outcomes, especially learning outcomes, for critical thinking/problem solving or ethics:

Student outcomes would be in relating the part to the whole. Having student recognize and focus on the solution, not the evaluation. Students understanding the reasoning behind the method ("the why") would be the goal.

#### Describe the implications of using this approach:

For the teacher you can make faster and quicker corrections while keeping in mind different styles of individual learning. You can organize your thoughts better under your time limits. Students absorb material better.

**Reflect on what is working and why it is working:**

It stimulates creative ways to solve and correct errors. It uses different ways to teach and reach students. It also helps with your pace of the learning activity.

**Describe student reaction to the educational approach:**

Students have better response as individual resistance to criticism is diminished. Better performance of skills within a team setting.

**Will the practice be sustained within the course? Yes, Will you do anything differently?**

Use this method more.

**Will you implement this teaching approach in other courses? Yes, Please Explain**

It is a universal teaching technique. It works in any setting.

**What advice would you give to other people adapting this approach?**

Please try it - it will make you a better teacher.

**Do you want this abstract to be considered for a Bright Idea Award? Yes**

## Critical Thinking/Problem Solving or Ethics

**Critical Thinking/Problem Solving or Ethics of Practices: Learning to SMILE: Developing First Year Students' Critical Thinking Skills using an Angel Based Scientific Method and Information Literacy Exercise**

**Name of Implementers:** Jason A. Porter, Alison M. Mostrom, Eva Agbada, Leslie Ann Bowman, Catherine B. Purzycki, Kevin C. Wolbach

**Discipline or type of course:** General Biology II (BS104, second semester of First Year)

**Telephone Number:** 215-895-3751, 215-895-1137, 215-596-8962, 215-596-8964,

215-596-8498, 215-895-3129 **Email Addresses:** [Ja.porter@usp.edu](mailto:Ja.porter@usp.edu), [a.mostro@usp.edu](mailto:a.mostro@usp.edu),

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**Department(s):** Biological Sciences, Information Science

**Type of Students:** First Year students

**Level of students for which this practice can work:** General education

**Type of Course or activity where implemented:** Lecture, Lab

**Size of class where this practice can be implemented :**Any size

### What resources do you use?

The assignment was completed and submitted on Angel and required students to use electronic databases to access and reference primary and secondary literature (Science Direct, ProQuest and Google Scholar)

### Describe the rationale or goals of the teaching approach:

Learning Objectives:

1. Students will demonstrate ability to complete an assignment on Angel
2. Students will demonstrate knowledge of the scientific method
3. Students will evaluate critically a scientific, primary article, using the foundation of the scientific method
4. Students will demonstrate ability to access information using electronic databases
5. Students will use information in an ethical and legal manner

### Describe the teaching approach:

During the 2008 spring semester of the yearlong General Biology series, students were asked to obtain, evaluate and analyze a specific scientific, primary article from the journal Animal Behavior. The assignment started with each student completing a pre-test that assessed the students' attitudes and knowledge base on several key topics:

- 1) relevancy of the scientific method and information literacy to their future academic and professional careers;
- 2) previous experiences with reading primary and secondary literature;
- 3) understanding of the scientific method;
- 4) ability to use electronic databases to access scientific literature
- 5) an understanding of what is plagiarism and how it is avoided.

Using specific papers they chose, students were instructed to complete a set of 32 questions on Angel. The questions assessed whether students understood the basis of the scientific method and could apply it to a particular experimental design. Students were educated how to complete the assignment and how to use the appropriate resources in a recitation period of each individual BS104 section.

## **How do you assess that the students learned critical thinking or ethics?**

Students were asked to critique the experimental design of their chosen paper and were to suggest how to expand the experimental design or to suggest a more appropriate design to test the hypothesis. Both of these options require the students to understand the purpose of the paper and critically evaluate the best way to test the proposed hypothesis; requiring them to use what they have learned in their lecture and lab courses about the scientific method and to put this into practice. This question is being assessed traditionally using an appropriate grading scale. Additional assessment includes comparing answers to pre- and post-tests as well as comparing success on the assignment to various performance indicators (SAT scores, Math Grades, English Grades).

## **Describe any changes in the implementation since the first time you used it:**

This assignment has been assigned for approximately 10 years, but this is the first time the assignment has been in an online format (Angel) and has included a pre- and post-test as part of the assessment.

## **Describe any student outcomes, especially learning outcomes, for critical thinking/problem solving or ethics:**

For many of the students, this is their first exposure to reading primary, scientific literature. This assignment gave students the opportunity to find a paper of interest, develop an understanding of the paper and determine if the experimental design was appropriate to address the proposed hypothesis. Students demonstrated the ability to access primary and secondary literature using electronic databases as well as find references for particular scientific topic.

## **Describe the implications of using this approach:**

The exposure to accessing and evaluating scientific literature will ingrain the tenets of the scientific method and how it is expressed in constructing scientific papers at a very early stage of the student's academic career.

## **Reflect on what is working and why it is working:**

The General Biology II BS104 course involves 376 first and second year (PT majors) students. Given that 98% of students completed both the pre- and post-tests and 99% of students turned the assignments in on time, we deduce that students are embracing the spirit of this assignment. From the responses on the pre-test, 82% of students felt that being able to understand and interpret scientific literature was extremely relevant, very relevant or relevant with only about 1% of students feeling this exercise was not relevant at all to their future course work. This data shows an inherent understanding from the students that developing critical thinking skills is important to being successful in a scientific discipline.

## **Describe student reaction to the educational approach:**

Students were given the opportunity to make comments on the post-test and most of these comments were positive and reflect that the students understand the importance of this kind of critical thinking exercise and that they appreciated a structured environment in which to become comfortable with this way of thinking and in using the technology necessary to access scientific information.

## **Will the practice be sustained within the course? Yes, Will you do anything differently?**

We will continue to offer the assignment in this format but will spend time each semester looking for redundancies that can be removed to more streamline the project. We will continue to require students to use technological tools (Angel, ProQuest, Science Direct, and Google Scholar) in completing this assignment.

**Will you implement this teaching approach in other courses? Yes, Please Explain**

I have found Angel to be an incredibly useful tool in delivering, receiving and recording assessment of assignments. I will continue, and likely expand, my use of Angel for all assignments to which it applies.

**What advice would you give to other people adapting this approach?**

This assignment is incredibly valuable but the assessment is quite laborious. I would recommend that a project like this be implemented gradually (for example, this project has been assigned for more than 10 years in some form) so as not to overwhelm the students who have to complete the assignment and the instructors to have to assess the assignment.

**Do you want this abstract to be considered for a Bright Idea Award? Yes**

## Critical Thinking/Problem Solving or Ethics

**Critical Thinking/Problem Solving or Ethics of Practices: Assessing Risk: Promoting Critical Thinking in a Environmental Microbiology Course**

**Name of Implementer(s):** Jason A. Porter, James R. Johnson

**Discipline or type of course:** Environmental Microbiology (BS 347)

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**Department:** Biological Sciences

**Type of Students:** This approach was offered in the Environmental Microbiology (Fall 2007) course offered as an elective to second, third and fourth year Microbiology, Biology and Biochemistry majors and Biology and Microbiology Minors

**Level of students for which this practice can work:** Advanced undergraduate

**Type of Course or activity where implemented:** Lecture

**Size of class where this practice can be implemented:** Less than 30

### What resources do you use?

The assignment was submitted by students using the course management software Angel. Students were required to use electronic resources in the USP library to find and access primary and secondary scientific literature to complete the assignment. In addition, students were given access to reports and "gray literature" from EPA, WHO and SEPA. Many students used the interlibrary loan program to obtain the sources they need to complete the assignment.

### Describe the rationale or goals of the teaching approach:

During lecture periods, students were taught about the fundamentals of aquatic microbiology and how the interaction of various macro and microorganisms works in a cyclic manner. Ideas of human induced impacts that may exacerbate these cycles were also introduced. However, it was the opinion of the authors that these concepts may appear to be abstractions without some real understanding of how this theory may impact in actual, real-life situations. This assignment also promoted students to find and access scientific literature and to write a succinct paper that convinced us that they understood the theory introduced in lecture and could bring to bear scientific literature that explains realistic environmental assessment. This approach was assigned as a take-home exam to fulfill the second lecture exam of the semester.

### Describe the teaching approach:

Students were given an article from the popular press that described a cyanobacterial outbreak in a lake important for drinking water and recreation in China. Students were asked to act as if they were individual contractors trying to secure a bid for risk assessment plans from the Chinese government. This risk assessment had to include the implications of the outbreak to the health of the ecosystem and the local population, what methods were needed to accurately assess the contamination and a short remediation plan describing how the students would address the problem. In addition to the newspaper article, students were provided with information on risk assessment and cyanobacterial blooms from the EPA and WHO as well as instructed to use the resources in the library to find primary and secondary research articles related to the case study. Students were also informed that as private contractors, they could consult with any other member of the course (instructors and students) but would have to pay a penalty of 2.5 points per consultation. However, reward of developing a quality plan and getting your bid accepted was a gain of 8, 6 or 4 points depending if your paper was 1st, 2nd or 3rd. These points could be applied to your exam grade or, in part or in whole, given to a contractor that was particularly valuable in completing the assignment.

### **How do you assess that the students learned critical thinking or ethics?**

The only assessment employed was assigning grades to the papers. Students who were able to take the concepts learned in lecture about general aquatic microbiology and apply these concepts to developing a risk assessment and remediation plan received the highest grades. The grades ranged from a 58% to a 99% with a mean of 79% and a standard deviation of 15%. Only one student took the opportunity to consult with any member of the class, so no meaningful assessment about students' collaboration could be conducted.

Describe any changes in the implementation since the first time you used it:

This is the first time this approach has been used in Environmental Microbiology.

### **Describe any student outcomes, especially learning outcomes, for critical thinking/problem solving or ethics:**

Many of the students who completed this assignment engaged themselves with the material and were able to successfully bridge the gap between the theory of aquatic microbiology and how this theory may inform the risk assessment of an environmental disaster, as well as strengthening their skills in writing a succinct, factually accurate paper.

### **Describe the implications of using this approach:**

Students will be better prepared to apply theoretical principles to realistic situations, a skill needed as they advance into scientific careers. Likewise, it gave the students another opportunity to enhance their scientific literature searching and paper writing skills.

Describe any changes in the implementation since the first time you used it:

This is the first time this approach has been used in Environmental Microbiology.

### **Reflect on what is working and why it is working:**

Most of the students did clearly engage themselves in this assignment suggesting students are eager to step outside of traditional assessment tools and expand their critical thinking skills.

### **Describe student reaction to the educational approach:**

Most students were excited to attack an interesting application of the theoretical knowledge they learned in lecture. However, the students did not take the opportunity to collaborate as much as we would have hoped.

### **Will the practice be sustained within the course? Yes, If Yes, will you do anything differently?**

We will continue to offer the assignment in this format with some changes to enhance student collaboration. Likewise, we will add further assessments other than just grades to understand if this assignment is achieving the learning objectives or not.

### **Will you implement this teaching approach in other courses? Yes, Please Explain**

This assignment essentially uses an inquiry based approach to translate theoretical ideas to realistic applications. We do believe this is an effective way to promote critical thinking and will attempt to implement this approach, in one way or another, into other courses.

### **What advice would you give to other people adapting this approach?**

I would suggest that a person focus a lot of attention on how to increase the collaboration amongst the students. Increased collaboration will lead to a more meaningful learning experience for the students.

**Do you want this abstract to be considered for a Bright Idea Award? Yes**

## Critical Thinking/Problem Solving or Ethics

### Critical Thinking/Problem Solving or Ethics of Practices: Teaching Ethics & Legal Constraints through the Use of Case Studies

Name of Implementer: Linda A. Robinson

Discipline or type of course: Psychology - Graduate Level

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Department: Social Sciences

Ethics and Problem Solving

Type of Students: Undergraduate & Graduate

Level of students for which this practice can work: Advanced undergraduate, graduate/professional

Type of Course or activity where implemented: Online class, Seminar/discussion

Size of class where this practice can be implemented: Less than 30

#### What resources do you use?

Several textbooks of ethical dilemmas, the APA Ethics Code (available as a downloadable document from [www.apa.org](http://www.apa.org)), questions specific to each ethical vignette, the internet (for additional research related to some questions), ANGEL courseware (specifically the discussion forum and chatroom features).

#### Describe the rationale or goals of the teaching approach:

The articulated course goals are as follows: Students will attain knowledge & competency in the following:

- A. The Five Guiding Principles for the practice of psychology
- B. The Ethical Standards for the practice of psychology
- C. Navigating conflicts between the Ethical Code and state or federal statutes.
- D. Analyzing ethical dilemmas vis-à-vis the applicable Ethics Code(s)
- E. Communicating potential ethical dilemmas via oral discussions and the written word.

#### Describe the teaching approach:

To fully engage the students with the course content (reading the Code and federal statutes which impact the practice of our profession can be as dry as week old toast), students analyze case studies (ethical dilemmas), engage in online research (sometimes), write up answers to specific questions following the vignettes and then discuss each of the vignettes so analyzed. Through the analysis, writing, and subsequent discussions, students quickly learn that there are many "gray areas" in applying the ethics code to the day-to-day practice of our profession. Because the class is a 'hybrid one,' some discussions occur in class while others occur online. Here's how it all plays out: For the first two weeks in the semester, I lecture on the Guiding Principles and relevant research articles which serve as the foundation for the APA Ethics Code. I present a number of short ethical dilemmas in class each week for discussion; these dilemmas are from the research literature and serve to illustrate the Guiding Principles in particular. The short dilemmas presented 'set the stage' for what will happen during the balance of the semester. Thereafter, students select (or are assigned if they are a bit tardy in their selections) several ethical vignettes to analyze. I sometimes also select vignettes from local or national news stories that are relevant to the Ethics Code under discussion for that week. There are typically 4-to-5 questions that each student must answer following each vignette. Oftentimes, the questions require students to do an internet search to address the question posed (e.g., licensing regulations for psychologists in their home state and in Pennsylvania!).

The students then post their written answers to their 4-5 vignettes to a "discussion forum" a full 24 hours before class time. During "class time" we either meet in the Angel chat room or meet in person. I allow the class to choose, at the beginning of the semester, how many 'in person' vs. 'chat room sessions' or Other sessions (for asynchronous discussions we will have during the course of the semester, summarized in the

paragraph, following the next one) we're going to have. Such a discussion can get a little messy, e.g., students want to try out the "chat room discussion" first before committing to a course of action. I'm flexible enough to deal with such messiness, however. Invariably, students choose more on-line chat room discussions than in-person discussions after the 'first taste' of it. By their nature, analysis of case studies, often yields many "gray areas" when it comes to perceived ethical violations. Discussions among and between students and myself can become quite lively, especially in the online chat room. Students seem less inhibited to disagree with a peers' analysis in the online format than in real time. I suppose it just feels safer, even though each person is aware of 'who is saying what' within the chat room. This course has a high participation grade weight (at 40 percent). I can more readily track both the frequency and the quality of peer feedback within the online chat room than in real time because of the tools that are available in Angel for saving the content of the online dialogue. Asynchronous sessions: Because this class is usually offered in the summer time, there are invariably issues concerning missed class time due to vacations and sometimes conference commitments. This is another area of discussion at the beginning of the semester. We decide to have about two asynchronous sessions during the course of the semester. The dates for those asynchronous sessions are firmed up. We do not meet either in-person or in the chat room. While class is cancelled, the respective assignments and reflections must then be done. Reflections: Each student reflects, in writing, on the work of about one-half of the other students' vignette analysis. These reflections, however, are not posted to the discussion forum. They're posted to a drop box for me to grade. I usually will discuss, during an in-person meeting following these asynchronous sessions, important elements of the analyses and reflections that occurred, so that all students are getting the same information.

### **How do you assess that the students learned critical thinking or ethics?**

- **PREPARATION:** Effectiveness in Leading Discussions on their respective ethical vignettes. I suggest to students to have questions ready for the class when they're in a 'leadership role' with their own vignette, i.e., questions not posed in the book or by me in conjunction with the vignette. (30 percent);
- **QUALITY:** Frequency of their classroom discussions, i.e., what they say in response to the analysis of other students' vignettes. (20 percent);

Midterm examination (20 percent)

Final examination (30 percent) both assessments are vignette based and require written responses.

Students must analyze each vignette, identify the relevant sections of the Ethics Code, and then identify a course of action that is both ethical and legal in solving the problem presented. When meeting in class, I'm writing down student reflections of the leader student's work (I'm also writing down behaviors of the student when in a 'leader role,' e.g., eye contact and the quality of the questions prepared to ask of the peers). After class, I make a judgment about the quality of the feedback that each student gave to his/her peers. Frequency of participation is also an ingredient in the calculation of the "participation" component of the grade.

The relative weights are 2/3 quality and 1/3 participation. I print out the transcripts from the online chat room, which provides an opportunity to go through exactly what each said (actually wrote). While this is a lot of work (we're talking upwards of 60 pages of discussion), I feel it is a more accurate capture of what transpired during the session.

### **Describe any changes in the implementation since the first time you used it:**

I've only taught this course two times. The format was virtually identical for both classes.

### **Describe any student outcomes, especially learning outcomes, for critical thinking/problem solving or ethics:**

I've never had such an "engaged" group of students in classroom discussion before teaching with case studies. Some students demonstrated better assimilation of the ethics code (via the two assessments) than

others. All students seem to have assimilated the foundational guiding principles! All students were able to demonstrate minimal competence with identifying relevant portions of the ethics code to the vignettes presented during class and in the formal examinations.

**Describe the implications of using this approach:**

Be prepared, as the instructor, to spend a lot of time - on a weekly basis - grading student participation (both quality and frequency).

Students are more engaged in discussion in the online format than in the real time format (even introverted students "talk" in the chat room).

Be prepared to be humbled, i.e., ask students to explain some of the unusual text messaging abbreviations that they are fond of using in the chat room.

It provides the introverted students with an opportunity to 'voice' themselves in a safe way (chat room) and feel some comfort that they haven't ever experienced before during classroom discussions.

**Reflect on what is working and why it is working:**

The case studies are interesting, for the most part. It requires students to synthesize previous parts of the ethics code and to look forward into parts of the ethics code that haven't already been examined. In other words, it forces them to make connections that they might not do otherwise in a classroom setting. The chat room discussions provide a 'safe place' for a discussion for the more introverted students.

**Describe student reaction to the educational approach:**

Students are indeed engaged with this teaching approach. They come to class (and especially online discussions) ready to hear another's point of view on a topic. Sometimes, they like to hear the concurrence of their peers (or this instructor) on their analysis of a problem situation. Students are especially engaged with the online discussions; they seem more willing to disagree with a peer than they are in the in-class discussions.

**Will the practice be sustained within the course? Yes**

More customized questions for some of the vignettes presented in the textbook.

**Will you implement this teaching approach in other courses? Yes Explain**

I've tried the online chat room for discussion questions with a freshman level class (PS100 Health Psychology Orientation). The freshman, like the graduate students, prefers the online discussions in the chat room.

**What advice would you give to other people adapting this approach?**

You'll be spending less time lecturing and more time grading student submissions of work (and of live discussions). You'll need a scoring rubric to be consistent in your 'quality metrics' from week to week, whether you are grading written submissions for the asynchronous classes, or the online and in person discussions. Supplement questions that are in the textbook following a vignette with some of your own. Dump some of the textbook questions following vignettes (some of them are just dumb).

**Do you want this abstract to be considered for a Bright Idea Award? Yes**

## Educational Practices that Work at USP

Please use this form to document educational practices that work at USP.

Title of Practice \*

Name of Implementer(s), (e.g. faculty, staff name) \*

Telephone Number(s) \*

Email Address(es) \*

Department(s) \*

Types of students for which this practice would work: \*

Level of Students for which this practice can work:

- Any level
- General education
- Advanced undergraduate
- Graduate/professional

Type of course or activity where this practice can be implemented: \*

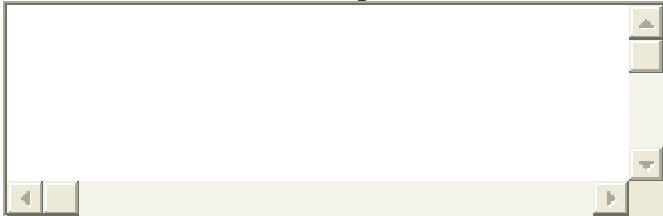
- Lecture
- Lab
- Service learning
- Field/clinic experience

- Online class
- Seminar/discussion

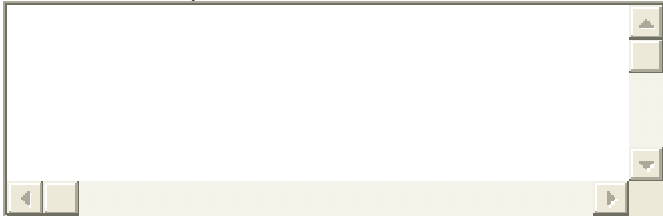
Size of class where this practice can be implemented: \*

- Any size
- Less than 30
- 31 - 69
- 61 - 100
- Greater than

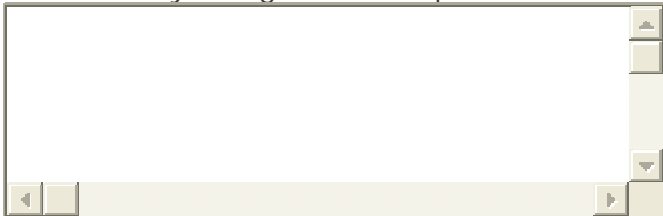
Describe the rationale or goals of the educational practice: \*

A rectangular text input field with a light beige background and a thin border. It contains no text. On the right side, there are three small square buttons with upward-pointing triangles. On the bottom left, there are two small square buttons with left-pointing triangles. On the bottom right, there are two small square buttons with right-pointing triangles.

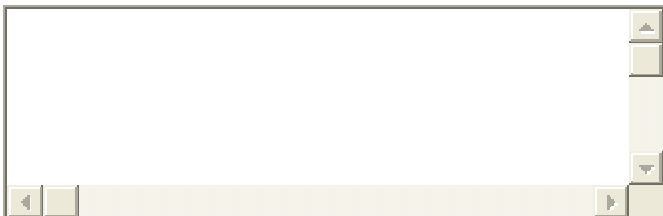
Describe the practice: \*

A rectangular text input field with a light beige background and a thin border. It contains no text. On the right side, there are three small square buttons with upward-pointing triangles. On the bottom left, there are two small square buttons with left-pointing triangles. On the bottom right, there are two small square buttons with right-pointing triangles.

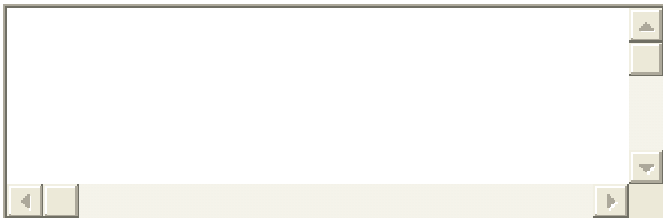
Describe any changes in the implementation since the first time you used it: \*

A rectangular text input field with a light beige background and a thin border. It contains no text. On the right side, there are three small square buttons with upward-pointing triangles. On the bottom left, there are two small square buttons with left-pointing triangles. On the bottom right, there are two small square buttons with right-pointing triangles.

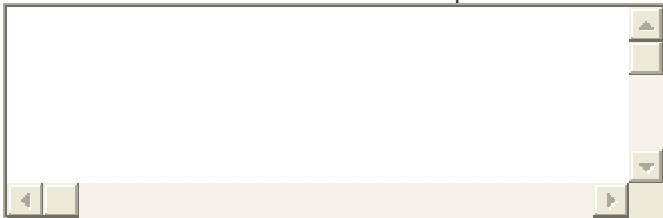
Describe any outcomes, especially learning outcomes, and/or the implications of the practice: \*

A rectangular text input field with a light beige background and a thin border. It contains no text. On the right side, there are three small square buttons with upward-pointing triangles. On the bottom left, there are two small square buttons with left-pointing triangles. On the bottom right, there are two small square buttons with right-pointing triangles.

Reflect on what is working and why it is working: \*



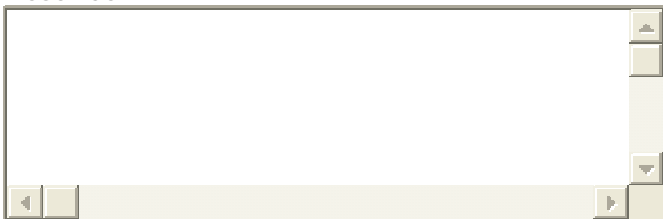
Describe student reaction to the practice: \*



Will this practice be sustained within the course? \*

Yes  No

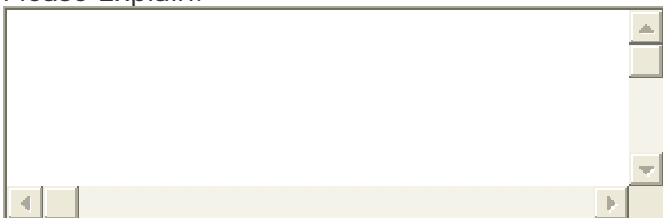
Describe



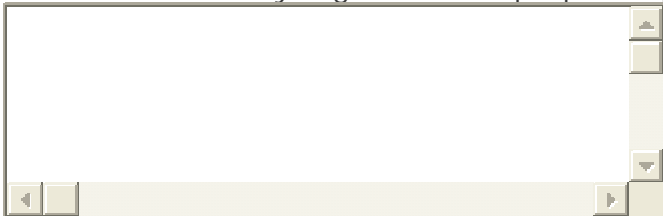
Will you implement this practice in other courses? \*

Yes  No

Please Explain: \*



What advice would you give to other people adapting this practice? \*



Do you want this abstract to be considered for a Bright Idea Award? (for a description of the Bright Idea Award see <http://www.usip.edu/teaching/award.shtml>) \*

Yes  No