TEACHING AND LEARNING PORTFOLIO

by

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Last Updated: May, 24 2006

This portfolio submitted in partial fulfillment of the requirements for the Delta Certificate in Research, Teaching, and Learning.

Delta Program in Research, Teaching, and Learning
University of Wisconsin-Madison

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2006

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OVERVIEW

Thoughts of teaching past….
How does one decide what to do with her life? For some, it is evident in childhood. For others, it is revealed slowly over time as has been my experience. A love of the outdoors led me to study environmental science, engineering, and chemistry with the underlying motivation being to understand and protect earth's bountiful, beautiful, and beneficial ecosystems. Support for environmental protection requires that people both recognize the value of natural resources and appreciate the vital role that natural systems play in their own health and well-being. Education is vital to achieving this end. Thus, the seeds of my desire to educate were planted alongside my desire to explore the inner-workings of the natural world. My own learning could be passed on to others for our mutual benefit as well as that of the natural systems upon which we depend. The question was: in what setting would I be able to realize this goal?

Thoughts of teaching present….
How fortunate for me that, during the second year of my Ph.D. program, I discovered the Delta Program in Research, Teaching, & Learning at the University of Wisconsin-Madison. Delta offered opportunities to learn about and explore strategies for effective teaching as well as to gain real-world teaching experience through wonderful internship offerings. I could even earn a Delta teaching certificate while working on my degree! My Delta experience included: 1) participation in the Expeditions in Learning course where we explored different campus environments and offerings; 2) completion of the Teaching Science and Engineering course which included much discussion of what it means to be a 'good' teacher as well as feedback on our own teaching; 3) preparation of activities addressing common misconceptions related to atmospheric environmental chemistry during the Instructional Materials Development course; and 4) implementation of the aforementioned instructional materials in a general chemistry class at Madison Area Technical College (MATC) through an internship opportunity. As a direct result of the experience I gained through the Delta program, I was offered and accepted a position teaching general chemistry at MATC during Fall 2005. Now I must ask myself what will I do next?

Thoughts of teaching future….
Having gained valuable teaching experience as a Delta intern and having put my new-found skills into practice as a full-fledged instructor, I now look forward to combining my interest in environmental issues with my teaching in new and exciting ways. I hope that in the future I can in some way contribute to the environmental education of students. How might I go about doing that?

The portfolio….
The teaching & learning portfolio that follows is organized around three themes: connections, challenge, and the 'bilities (stay tuned for an explanation of the 'bilities). In it, I describe and illustrate my philosophy regarding teaching and learning, provide examples of materials I used in the classroom, and present feedback I received from students. It is intended to provide a glimpse of myself as a continually evolving teacher.

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TEACHING & LEARNING PHILOSOPHY

Confucius said "Every truth has four corners: as a teacher I give you one corner, and it is for you to find the other three." I believe a teacher should, first and foremost, challenge students to expand their critical thinking and problem-solving skills by making new knowledge relevant and creating situations in which students can apply this knowledge. This process can both inspire and encourage all students to learn.

Challenges lift both skills and confidence among those who succeed in overcoming them. As a student on an experiential learning expedition in Colorado's high country, I was presented with a map which I'd been taught to use and was set free to find my way through the mountains. The path I took was not an easy route, but to this day I have vivid memories of the fantastic journey and have not lost my orienteering skills. The process of learning a set of skills then applying them in a new situation sharpened my critical thinking skills and facilitated knowledge retention.

As a student of environmental engineering, what turned out to be the best course I took was one in which I started out poorly. The assignments were challenging given that I had little background in the subject and because they were complex design problems for which there was no right answer. However, because they dealt with real-world environmental problems, I was interested in being able to address them. I met with the professor out of concern for my poor performance. His positive feedback encouraged me to continue in the course. I wanted to prove that I could do it so I worked hard. My improvement was recognized by the professor and I gained confidence in myself as a result of my ability to rise to the challenge.

I believe each individual student should be encouraged to achieve their full potential. It is important to recognize that students in a classroom have different life experiences, different background knowledge, and different abilities. Individual characteristics and diversity must be acknowledged when designing curriculum that will maximize learning for all students. As a young girl, I was told that if I put my mind to it, I could accomplish whatever I wanted. Despite being in a traditionally male-dominated field, I never felt excluded or isolated because I was in the minority. I believe this was in large part because of the encouragement I received and the confidence I had in myself.

Teaching requires one be vulnerable to people who are not required to be respectful, open, or tolerant. Being in position to be criticized is difficult but any potential insult to one's pride should be replaced by the recognition that our search for knowledge and understanding is never complete. During my first teaching experience at a community college, I had to field some challenging questions and gave the best answer I could. After reflecting on the experience, I realized a better answer would have been to acknowledge that they were good questions and that I did not have a definitive answer. This was an example of the teacher learning from the students because I was intrigued by the question and did some further research on the subject. By remaining open-minded and flexible, I furthered both my own knowledge and teaching ability.

Teaching is analogous to climbing a mountain or succeeding in a difficult course. All three journeys are simultaneously grueling, given the challenges involved, and rewarding, given the sense of accomplishment associated with each. Why suffer through these challenges? For the reason that upon accomplishing the goal, it feels like you are on top of the world.

REFLECTIONS ON MAKING CONNECTIONS

If the theory of six degrees of separation is true and any one person on earth is connected to another through a chain of only six acquaintances, then it is a small world indeed. Not only are people connected to each other through social networks, but physical entities such as the energy and nutrients that sustain life are also connected across apparent boundaries between land, sea, and sky. Connections are also vital in a myriad of contexts throughout teaching and learning:

- First, interdisciplinary connections are important to emphasize to students the interconnectedness of the subjects under study as well as in the world around them.
- Second, students will be much more engaged in the learning process when an attempt is made to include real-world examples or provide real-world experience so as to make the connection between new knowledge and students' lives.
- Third, teacher – student, student – student, and teacher – teacher connections are essential for fostering communities both inside and outside of the classroom which maximize learning for all.
- Finally, instructors can make connections between teaching and research in order to assess the effectiveness of classroom activities in an attempt to improve the learning environment for students.

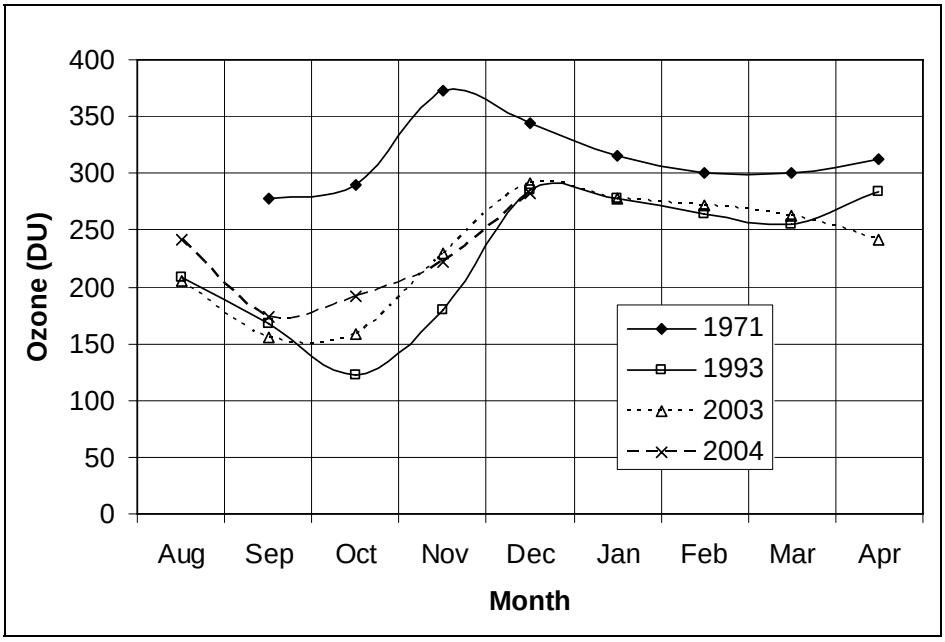
Connecting Disciplines

My chosen field of study, environmental science, is a perfect example of an interdisciplinary field of scientific endeavor. Knowledge of chemistry, biology, geology, and hydrology, to name of few, is necessary to address research questions in the field. Just as water weaves its way through rocks, rivers, oceans, and skies, scientific concepts can be woven through science, technology, engineering, and math (STEM) disciplines. Treating subject matter in a more interdisciplinary way can make concepts more relevant to students and facilitate retention of the material.

As an intern with the Delta Program for Research, Teaching, and Learning, I had the opportunity to construct a bridge between chemistry and environmental issues for undergraduate general chemistry students at Madison Area Technical College (MATC). My project involved addressing misconceptions prevalent among students and the general public regarding the relationship between global warming and holes in the ozone layer. It is a commonly held belief that holes in the ozone layer are allowing more heat from the sun to enter earth's atmosphere resulting in global warming. In fact, the two environmental problems are caused by very different mechanisms and are separate issues. My faculty partner at MATC, Ken Walz, includes an environmental chemistry unit in his College Chemistry 2 course but noticed that lectures on the subject were not adequately addressing the misconception. Together, we wanted to create classroom instructional materials that would help students to better understand atmospheric environmental chemistry. Unfortunately, it is impossibly difficult to conduct laboratory experiments

illustrating the necessary concepts so we instead created a set of four computer-based data analysis activities aimed at addressing students' misconceptions regarding the relationship between global warming and ozone holes. The activity shown below is one of the activities we implemented in the College Chemistry 2 class (Figure 1).

Graph of mean total ozone versus time and accompanying questions for the ozone depletion activity. Data obtained by the British Antarctic Survey at Halley Station, Antarctica.



1. Describe the trends you observe in the data when looking at changes from year to year during the 1971-2004 period. Are ozone levels increasing or decreasing? Does the data present any reason to be concerned? Explain your answer in a few sentences.
2. During which season (spring, fall, winter, or summer) do the lowest ozone levels occur? (remember these measurements were taken in the southern hemisphere). Can you think of any astronomical or meteorological phenomena that might be associated with ozone levels in the Antarctic atmosphere?
3. What factors might account for the trends you see in ozone levels from 1971 to 2004? Explain any changes that you observe.

Figure 1. Activity completed by general chemistry students at MATC which illustrates a connection between chemistry and environmental issues.

By completing this activity, students had the opportunity to plot for themselves the data showing the annual trends in ozone over the Antarctic continent and how they are changing over time. Students were required to answer the accompanying questions which were intended to promote critical thinking on the part of the students.

After completion of all four activities, we followed up the individual learning with lecture-based instruction and small group discussions. Here, we illustrated the mechanisms leading to global warming and ozone depletion and the chemistry involved in these contemporary environmental problems. This connection between environmental science and chemistry illustrated to students the application of chemistry in their daily lives and emphasized the interdisciplinary nature of the subject matter.

Connecting Knowledge to Students' Lives

My own experiences with experiential learning, be it while learning survival skills in the wilderness, analytical skills in the laboratory, or computational skills in a lecture-based course, have proven to me that going through the process makes the skills being taught more relevant and allows a student to take ownership of the newfound knowledge. Thus, I strongly believe that making connections for students by providing real-world experiences and examples is a vital tool for maximizing learning.

My Delta internship experience involved implementation of the instructional materials that had been developed to address students' misconceptions regarding the relationship between global warming and ozone depletion. Indeed, the internship itself was an experiential learning experience as it provided me my first classroom teaching experience. I presented lectures on global warming, ozone depletion, and urban smog as a follow-up to the four computer-based data analysis activities the students completed individually. The lectures were combined with small group activities and discussion. My goals for the lectures were two-fold: first and foremost, I wanted to present the mechanistic details involved in global warming, stratospheric ozone depletion, and tropospheric ozone formation so that students would overcome their previous misconceptions and come away with a clearer understanding of the causes of and relationships between these atmospheric environmental phenomena; second, I wanted to engage students in the learning process so that they were interested in what was being presented and would remember what they had been taught. Indeed, the students were shocked to learn that Sheboygan, Wisconsin was number twenty-two on the list of the most ozone polluted cities in 2005 according to the American Lung Association. This example really awakened interest in the issue among the students. The slides that follow are those that I created and presented during a lecture on urban smog to general chemistry students at MATC as part of my Delta internship (Figure 2).

In recognizing that urban smog was a problem happening not just thousands of miles away but also very close to home, students realized that the issue may directly impact their lives and thus having knowledge of the problem was important. The same idea is applicable for any idea or skill a teacher is attempting to convey: if a student recognizes where the knowledge or skill may touch their own life, he/she will be much more engaged and interested in learning.

Smog Formation

Los Angeles, California

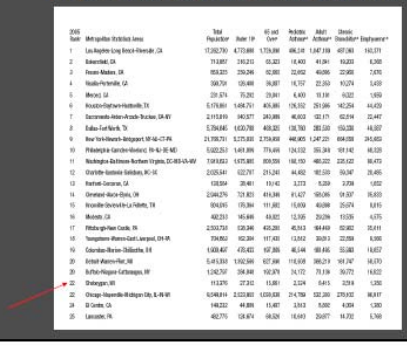
Mexico City

Beijing, China

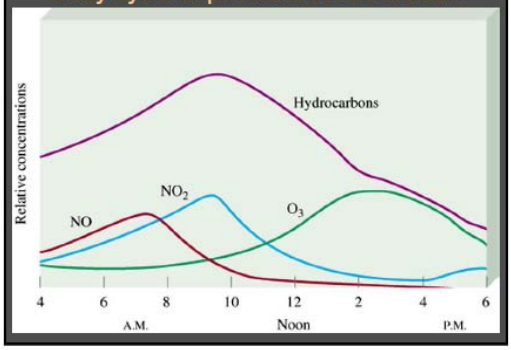
Health Effects of Smog

- *Acute effects:*
  - Shortness of breath
  - Chest pain
  - Wheezing & coughing
  - Increased susceptibility to infection
- *Chronic effects:*
  - Risk of premature death
  - Pulmonary inflammation
  - Risk of asthma attacks
  - Need for hospitalization for people with asthma
  - Decreased lung function in children

People at Risk in 25 Most Ozone-Polluted Cities



Daily cycle of pollutant concentration



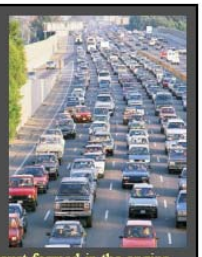
Smog = Ozone

Photochemical smog is formed by the reactions of automobile exhaust in the presence of sunlight.

NO_x + VOC + sunlight + heat $\longrightarrow$ O_3

Primary pollutants: NO, CO and unburned hydrocarbons

Secondary pollutants: NO_2 and O_3



$N_2\ (g) + O_2\ (g) \longrightarrow 2NO\ (g)$ Exhaust formed in the engine

$2NO\ (g) + O_2\ (g) \longrightarrow 2NO_2\ (g)$ Exhaust exposed to air

$NO_2\ (g) + h\nu \longrightarrow NO\ (g) + O\ (g)$

$O\ (g) + O_2\ (g) + M \longrightarrow O_3\ (g) + M$ M = inert substance (N_2)

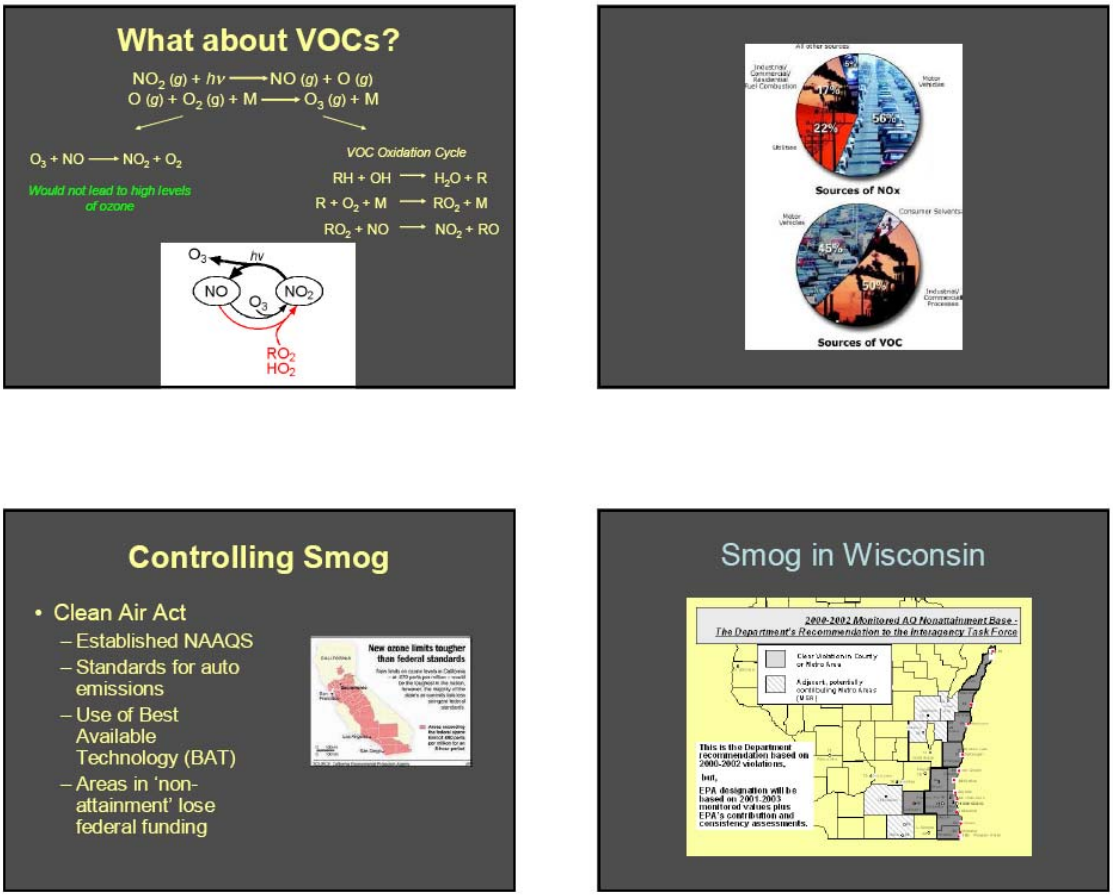


Figure 2. PowerPoint slides illustrating the use of real-world examples to connect knowledge to students' lives. These slides were presented during a lecture on urban smog to general chemistry students at MATC.

Connecting People

Learning communities are groups of individual learners built around the common goal of shared learning, intellectual exploration, and knowledge building. Such groups effectuate a sense of support among both teachers and learners. Bringing together different perspectives in a group of teachers, learners, or both facilitates many benefits including the incorporation of new ideas into a teacher's classroom, different approaches to solving a problem among students, and the infusion of energy and experience into the learning process.

Part of the challenge in creating learning communities is bridging the differences that may exist among group members. Diversity is one of the reasons the world is such a fascinating place, and by recognizing and respecting differences in people, we all benefit from the wealth of experience that is brought to the table. The definition of diversity extends beyond the traditional categories of race, gender, etc. to include differences in learning style, background, and even personality. To create successful learning

communities, it is critical that members feel that their mode of learning is accommodated and feel that their perspective is valuable to the community.

Student Learning Communities

I believe that learning communities both inside and outside of the classroom which respect and celebrate diversity are an integral part of a learning environment designed to encourage all students to achieve their full potential. Student learning communities can be fostered by using group activities in the classroom. Once students get to know each other inside the classroom, they are more likely to get together outside the classroom and this interaction can benefit the students by leading to more productive study sessions and learning support. Student-teacher learning communities can be fostered through work on larger community-based projects throughout the semester. By venturing beyond the classroom material, the teacher can present him or herself as a learner and serve as a mentor for the students in a role that goes beyond the classroom routine. Teacher learning communities can be fostered through events organized around a teaching-and-learning topic. By being exposed to new ideas and having the opportunity to discuss these ideas with colleagues, teachers can bring innovative ideas and techniques to the classroom which can benefit the learning experience for students.

Throughout all classroom and learning community activities, diversity should be considered and respected. Both students and teachers must feel their individuality is valuable so that they will feel comfortable as a contributing member of a learning community as well as an active participant in the learning process. Students in my chemistry class at MATC spanned a very wide range of backgrounds from returning adult students to military vets to nursing students. They also spanned a wide range of abilities. Thus, to maximize learning for all it was necessary to utilize different teaching styles and approaches to reach the various learning styles as well as to move at a pace that was not too fast for the struggling students but not too slow for those who grasped the concepts easily. I incorporated PowerPoint lectures, chalk-talks, group activities, problem-solving, and hands-on activities in the course. The fact that in the evaluation I administered at the end of the course I had a few students complain about each of the above components of the course indicates to me that I likely used an appropriate balance since no one approach will work for all students.

During my semester of teaching general chemistry at MATC, I encouraged students to study together both inside and outside of class. I often used group activities during the lecture periods to get students to share and think about ideas. At first, I was skeptical about the effectiveness of group activities in promoting learning. In my limited experience with them as a learner, I did not find them effective. However, I believe my negative experience was the result of the failure on the part of the course instructor to foster a supportive and successful learning environment. My observations of students working on group activities in my class were positive. They stayed on task and worked their way through the problems. By going through the activity in class, they had the opportunity to ask questions if they got stuck whereas if they were to attempt the activities on their own, they may not have someone to ask if they got stuck and would be more likely to get frustrated and give up.

Student-Teacher Learning Communities

My experience with student-teacher learning communities came through the Instructional Materials Development course offered by the Delta program at the University of Wisconsin-Madison (Figure 3). It was a new experience for me in that graduate students and faculty enrolled in the course together and were essentially on equal footing as students in the class. Discussions of teaching and learning issues were greatly enhanced by having both the perspectives of the 'learners' (graduate students) and the 'teachers' (faculty members). I believe such learning communities foster greater respect and understanding among individuals for the position (teacher or learner) opposite their own.

Figure 3. Graduate students and faculty in the Instructional Materials Development course offered by the Delta program at UW-Madison formed a learning community.

Teacher Learning Communities

Teacher learning communities can develop naturally within departments. The chemistry department at MATC was very supportive of me during my semester of teaching. They shared materials which gave me ideas as to how to present materials as well as activities I could use to help students through the learning process. It was also very helpful to have guidance with the pacing of the course, given the amount of material that needed to be covered. I believe that expanding this type of learning community to include multiple departments would be an excellent way to foster interdisciplinary interactions.

Connecting Teaching and Research

One of the goals of my Delta internship project was to assess the effectiveness of the materials being implemented in helping students to overcome their misconceptions surrounding atmospheric environmental chemistry. To accomplish this goal, I utilized a Teaching-as-research (TAR) strategy which involves the application of the scientific method to classroom instruction. The TAR process includes identification of a learning problem, review of previous materials and strategies used to address the problem, creation of new materials and development of a strategy aimed at addressing the problem, and assessment of the effectiveness of the materials as indicated by student learning. To me, TAR represents a specific method through which to improve student learning by focusing on well-defined learning challenges. The critical instrument needed to successfully use the TAR method is assessment. The difference between assessment used in the context of TAR and assessment used in the traditional sense (assignment of grades; course evaluations) is that the former involves assessment designed to target a question of interest to the instructor, the results of which will be used to inform the instructor as to the effectiveness of his / her strategy for addressing the question of interest whereas the latter need not involve either of the aforementioned components.

The following survey is the assessment tool used in the MATC chemistry course to gauge students' learning gains with respect to atmospheric environmental chemistry (Figure 4):

Atmospheric Environmental Chemistry Survey

This survey is part of an educational study being conducted between MATC and UW-Madison. The data from this survey will be used to develop and improve future instruction. Your response is greatly appreciated.

1. Global Warming is a significant environmental problem:

Strongly disagree ←----------→ Strongly Agree
0 2 4 6 8 10

2. Which of the following statements accurately describes the relationship between the greenhouse effect and the ozone hole?

a) The hole in the ozone layer triggers greenhouse warming
b) Global warming due to the greenhouse effect results in ozone destruction
c) Both the ozone hole and the greenhouse effect are caused by automobiles
d) The greenhouse effect and the ozone hole are separate atmospheric phenomena that have different primary causes.
e) Global warming and the ozone hole are natural processes that have been occurring for millions of years

3. Which of the following is NOT an effect that may result from global warming?

a) A rise in sea levels
b) An increase in global temperatures
c) An increase in levels of harmful Ultraviolet (UV) radiation reaching earth's surface
d) A change in global precipitation patterns

4. The 'hole' in the ozone layer leads to which of the following:

a) Increased surface temperatures
b) Increased rates of skin cancer
c) Changing weather patterns
d) Melting of polar ice-caps

5. Which of the following does not contribute to smog formation?

a) Motor vehicles
b) Industrial processes
c) Electricity production
d) Use of CFCs

6. Which of the following statements accurately describes the environmental effects of ozone?
(Circle all that apply)

a) Ozone is an environmental toxin that is hazardous to humans
b) Ozone is an essential component of the upper atmosphere
c) Ozone prevents the effects of harmful radiation (e.g. skin cancer, cataracts, etc.)
d) Ozone may be harmful or beneficial depending on its distribution in the atmosphere
e) Ozone levels vary greatly depending on meterological (weather) and anthropological (human) variables.

7. Which of the following is NOT a greenhouse gas?

a) Carbon dioxide
b) CFC
c) Oxygen
d) Methane
e) Nitrous oxide

8. Chlorofluorcarbons (CFC's) are most closely associated with which of the following?

a) Urban smog
b) Ozone hole
c) Greenhouse effect
d) Acid rain
e) None of the above

9. Nitrous oxides (NO_x) are most closely associated with which of the following?

a) Urban smog
b) Ozone hole
c) Greenhouse effect
d) Acid rain
e) None of the above

10. In 3 sentences or less, provide your best description of global warming.
(Please do not use external resources to answer this question – i.e. textbook, Google, etc.)

Figure 4. Atmospheric environmental chemistry survey administered to general chemistry students at MATC as part of the teaching-as-research process.

The aim of this survey was to establish whether students improved their content knowledge as a result of the learning experiences offered as part of the atmospheric environmental chemistry unit and determine whether they overcame any previously held misconceptions surrounding the topic. To accomplish this goal, it was necessary to establish students' prior knowledge on the topic and then reassess the students after having participated in the various learning experiences. The survey was implemented

three times during the semester: prior to any instruction on the topic, immediately after students independently completed the computer-based data analysis activity, and after student participation in subsequent lecture-based instruction and small-group discussions. Student responses were analyzed for improvements in learning as a result of completion of the activities alone as well as improvements resulting from the integration of the individual activity, lecture-based instruction, and small group discussion. Students saw an approximately 10% improvement in the former case and upwards of 50% improvement in the latter case with respect to understanding of concepts related to atmospheric environmental chemistry. Thus, we concluded that the activities were moderately helpful when used independently but the integration of the computer-based activities with the lecture-based instruction and small-group discussions was much more successful in helping students to overcome misconceptions. I believe the activities were particularly useful in that they planted seeds of inquiry in the students' minds prior to attending lecture. The questions we required students to answer were not easy for them, but even if they were not able to come up with the correct answer, they were at least thinking about it and would be that much further ahead during the lecture period.

The process of utilizing Teaching-as-research in the classroom provided me with a new perspective on teaching strategies and the use of assessment in the classroom. I came to see assessment as a tool to be used to improve learning in the course rather than just a means by which to assign a grade. I encountered new assessment techniques that were simple to implement but provided important feedback regarding student progress and understanding in the course. My favorite is the 'Muddiest Point' classroom assessment technique which involves students writing down the concept which is most confusing to them at that point in time. I implemented this technique on a number of occasions in my general chemistry class at MATC and used the feedback to guide my focus in lectures and identify concepts that I needed to review. Results from the assessments used in a course can be used to identify learning problems and misconceptions among students. Then, through the TAR approach, existing materials can be improved or new materials developed, with the aim being to address an identified learning problem. The materials can then be implemented and reassessed to determine their effectiveness. Thus, research skills can be applied in the classroom to facilitate the ultimate goal of maximizing learning for all.

REFLECTION ON CHALLENGE

A critical piece of the educational process is to teach students problem-solving skills and to encourage them to think for themselves. It is a rare student who remembers all the factual pieces of information presented during his or her academic career, but all students can walk away from an educational institution with the resources and ability necessary to meet the problems they will encounter both professionally and personally as well as to evaluate the barrage of information that will be constantly thrown at them throughout their lifetimes. In other words, the most important skill for students to gain from their educational experience is the ability to think critically.

To foster critical thinking among students, instructors must provide challenges which require students to expand their horizons and thinking about problems or issues in a new way. However, the instructor must be aware of the students' abilities and recognize the level to which he or she can push the students without causing so much frustration that the student gives up. This can be accomplished through frequent course evaluations and interaction with the students. The instructor must be available to provide support to students as they work through difficult assignments and projects.

The instructional materials developed as part of my Delta internship project included a critical thinking component as part of the small-group discussion activities. Small group discussion took place immediately after lecture-based instruction on a particular atmospheric environmental chemistry topic. The following is an activity which accompanied the lecture on global warming (Figure 5). Students worked in groups on the activity with the instructor circulating to answer any questions. A wrap-up discussion was then conducted as a class. By requiring the students to evaluate information presented by the mass media, they were challenged to apply their newfound scientific knowledge and think critically about what was being said in the article.

Activity – Greenhouse Gas Reading and Discussion

Read the article provided on the subject of global warming and discuss with your classmates. Attempt to answer the following questions:

1) Do the writers support their arguments with scientific data?

2) Based on what you've learned, would you say these arguments are sound?

3) Is there sufficient scientific evidence to conclude that global warming is occurring?

4) What action(s), if any, should the U.S. government take with respect to global warming?

5) What are some suggestions that you have to help the U.S. and other countries meet their future energy while ensuring adequate protection for the Earth's environment?

Figure 5. Small-group discussion activity on global warming designed to encourage critical thinking.

REFLECTION ON THE 'BILITIES

The 'bilities refers to three characteristics I believe are important for a teacher to have and which I tried to emulate as an instructor:

- approachability
- accessibility
- flexibility

The quotes interspersed throughout this essay, which were obtained through a Student Evaluation of Learning Gains (SALG) assessment tool implemented at the end of the MATC general chemistry course which I taught, reflect my students' opinions on how well I accomplished my goal of being an approachable, accessible and flexible teacher.

For students to feel free to ask questions and seek help from an instructor, they must feel comfortable in approaching the instructor in the first place. If they are worried they will be looked down upon for asking a 'stupid' question, they are likely to try to figure it out on their own or leave it unanswered. Thus, approachability is key in helping students through the learning process. I also believe that simply by seeing the instructor as being approachable, the students view the course material as being more approachable as well.

"The teacher was very approachable and able to answer my questions."
- MATC chemistry student

"Instructor very approachable and patient in regards to explaining subject matter. Instructor made sure the student understood the material"
- MATC chemistry student

"The instructor was very approachable. She would stay after class as long as she could to further explain concepts. She had a lot of patience with us."
- MATC chemistry student

Figure 6. Student comments on instructor's approachability obtained through a SALG assessment tool at the end of the semester from MATC students enrolled in the author's general chemistry course.

Accessibility is related to approachability in the sense that it requires the instructor be available and willing to meet with students. As a part-time instructor at MATC, I did not have office hours but encouraged my students to talk to me after class, during lab, or by email. I almost always had students stay after class to ask questions and had no complaints that I was not available for help outside of class. I also believe accessibility applies in another sense, that being the ability of the instructor to explain concepts at a level that students can understand. I always made an attempt to ensure that students understood the terminology I was using, that I spoke slowly enough so I did not lose anyone (I personally have a hard time absorbing material when someone speaks too quickly), and that I threw in some attempts at humor so that class was not so serious that we couldn't have a little fun.

The third 'bility refers to flexibility which I believe is a critical quality for a teacher. If an activity is not going well, the instructor needs to be able to adapt quickly and direct the

"I didn't like the powerpoint presentations. I learned more from the outlines that were passed out early on rather than slide/note sheets."

- MATC chemistry student

"Thanks for all your help, and thanks for the adjustments you made to your lectures. Things were very easy to understand and I enjoyed my time in your class."

- MATC chemistry student

"Sara taught this class very well. She adjusted when she saw that things were not working and was very fair."

- MATC chemistry student

Figure 7. Student comments on instructor's flexibility obtained through a SALG assessment tool at the end of the semester from MATC students enrolled in the author's general chemistry course.

class towards something more productive. During my first few weeks as a new instructor, I was very nervous. I prepared PowerPoint presentations for use in class, primarily because this was the presentation style I was most familiar and comfortable with. However, after a couple of PowerPoint lectures which did not go very well, I started to panic. My style wasn't working and I was worried that maybe I just wasn't cut out to be a teacher. Still, I had the rest of the semester to get through so I had to do something. I was also taking a class at the university at the time and had an instructor who would distribute outlines at the beginning of class. I found this to be very useful as a learner because I didn't have to take so many notes and could pay more attention to the lecture. It dawned on me that for the instructor, the outline could give cues in the same way as PowerPoint but give more flexibility at the same time. I tried this new approach in class where I handed out a lecture outline to the students and did a chalk-talk lecture based on the outline. By changing my approach, the lectures went much more smoothly, I was able to be more interactive with the students and, most importantly, the students were able to follow the lecture better. Thus, my flexibility led to an improved experience for both the teacher and the learners.

REFLECTION ON FUTURE OPPORTUNITIES

Through my teaching experience gained through my internship with the Delta program and my part-time teaching position with the Madison Area Technical College, I have gained invaluable skills and learned some important lessons which I will apply in future teaching engagements. The most important teaching strategies I have learned are the use of:

- assessment for the improvement of instructional materials in the classroom
- different teaching styles to address diversity among learners in the classroom
- group activities in the classroom
- an interactive presentation style in the classroom to encourage active learning

I try to use experiential learning whenever possible meaning I seek out ways for students to apply their knowledge to real world problems. In addition, if connections can be made to concepts students may have encountered in other courses, I try to emphasize these to show the interdisciplinary nature of scientific inquiry as well as to emphasize previously learned knowledge so as to facilitate retention. Finally, I aim to challenge learners to think critically about problems and become more confident in their abilities.

I am always interested in trying to incorporate environmental issues into the curriculum being studied. Environmental issues carry aspects of many different disciplines and thus offer a variety of opportunities for students to apply their knowledge to real-world problems. This benefits both the individual students, by making the concepts being emphasized more relevant to their lives, as well as to society as a whole by increasing awareness of environmental problems and solutions.