TEACHING MATTERS

The Newsletter of the Center for Effective University Teaching

Teaching, Learning and Scholarship: Making the Connection

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- Miriam Rosalyn Diamond

What constitutes "good teaching"? How do we differentiate effective lessons from less-effective ones? Is it purely anecdotal? Intuition-based? Apparent from how happy our students seem?

There actually is a science of questioning, studying and evaluating educational approaches and their outcomes. Through the Scholarship of Teaching and Learning, or SoTL, outcomes of numerous instructional approaches can be evaluated and resulting information disseminated to other faculty making decisions about their own courses.

In recognition of this process, the Center for Effective University Teaching and its advisory board introduced Northeastern's first "Scholarship Reconsidered – Reconsidered" symposium, held on November 19, 2004. Descriptions of twenty-seven educational investigations were conveyed through poster and presentation sessions – including health care education and political science, from art to marketing and science. Faculty in attendance had the opportunity to hear about techniques, curricula, methods of evaluation and findings from their colleagues.

The program began with an address by Arthur Ellis, National Science Foundation Division Director in Chemistry. Ellis described "Grand Challenges" to which the NSF is calling attention. These include the need to integrate contemporary research and findings into educational curricula in real-time. This can occur by involving more people whose main focus is education in the process of inquiry as early as possible (through undergraduate research programs, for example). This goal can also be realized by linking more researchers with instructional activities.

Ellis feels that faculty at major research institutions need to address the dual objectives of "creating new knowledge" and "communicating new knowledge." Developing and evaluating innovative methods of teaching and learning is key to both of these missions.

Following Professor Ellis' remarks, over fifty faculty and staff members attended a luncheon, where food was not the only thing being sampled. Three examples of Northeastern educational research programs were highlighted:

- Mary Anne Gauthier and Barbara Kelley of Nursing discussed the effects of concept maps in broadening future nurses' understanding of environmental, cultural and other considerations that influence patient health and decision-making,
- Gail Begley of Biology presented outcomes of an integrated learning approach used in teaching Microbiology to health care students, and
- Jean Krasnow and Claudia Grose revealed findings from 2-step service-learning programs designed to increase cultural awareness and skills among education majors preparing to teach in urban settings.

In This Issue

Faculty discuss Posters at symposium.

In addition, a range of intriguing posters and discussants demonstrated many areas of educational inquiry. These included:

- Nicholas Gross, Marta Hersek, Emanuel Mason and Arun Bansil's investigation on the use of constructivist instruction to increase understanding and interest in the sciences among non-science majors,

- Margarita DiVall and Michael Gonyeau's use of palm pilot entries to track Pharmacy student on-site decisions and actions, and

- Susan Freeman and Beverly Jaeger's exploration of learning outcomes from the use of pair programming to complete Engineering assignments.

(Please see box for a complete listing of scholars and research shared).

To further inform members of the Northeastern community about the many projects taking place, the CEUT is planning to produce a publication detailing programs, studies, findings, and insights provided by SoTL contributors. It should be available this spring.

As a result of this event, attendees came away informed, inspired and motivated to look at their own teaching in new ways. They also made connections – with other faculty, and between teaching and research.

Miriam Diamond is Associate Director of the Center for Effective University Teaching, and is available to assist faculty interested in designing SoTL studies.

Arthur Ellis discusses SoTL with Lorna Hayward of Bouve.

SoTL Posters

Scholarship Reconsidered: Reconsidered
November 19, 2004

Andre, Rae of Human Resources Management. "Pedagogical Issues in Writing a Practice-Oriented Textbook."

Aronowitz, Teri of Nursing. "Teaching Adolescents about Adolescence: Insights from and Adolescent Health Course."

Barr, Judy of Pharmacy Practice. "Evolution of a Competency-based, Reflective Portfolio for Pharmacy Students in the Advanced Pharmacy Practice Experiences (APPEs) of the Doctor of Pharmacy Program (PharmD)."

Begley, Gail of Biology. "Connecting the Dots: Integrating Practice in an Allied Health Microbiology Course."

Christensen, Margaret of Nursing; Rohm, Andrew of Marketing, and Diamond, Miriam of CEUT. "Acting Up in the Classroom: Methods of Active Learning & Assessment."

Dallimore, Elise of Communication Studies; Hertenstein, Julie of CBA; and Platt, Marjorie of CBA. "Reflecting on Pedagogy: Using Required Participation to Enhance Students' Oral and Written Communication Skills."

Dendy, Jamie of University Libraries. "Automated audio orientation of Snell Library for new freshmen."

Feinstein, Allen of Music. "When the Ensemble Creates the Film Score: Guiding the creation and performance of an original silent film score by non-composers."

Fitzpatrick, Diane and Golub-Victor, Ann of Physical Therapy. "Healthcare advocacy: A strategy for cultivating Physical Therapist Student Advocates."

Freeman, Susan and Jaeger, Beverly of Engineering. "Pair Programming Applied Successfully in a First Programming Course."

Gauthier, Mary Anne; Kelley, Barbara; and Babington, Lynn of Nursing. "Influences on Health and Illness, Concept Mapping."

Gonyeau, Michael and DiVall, Margarita of Pharmacy Practice. "Evolution of Doctor of Pharmacy student clinical interventions during Advanced Pharmacy Practice Experiences."

Gross, Nicholas of Physics; Hersek, Marta of Physics; Mason, Emanuel of Counseling & Applied Psychology and Bansil, Arun of Physics & School of Education. "The Embedded Learning Modules (ELMO) Project: A New Generation of General Science Classes."

Hayward, Lorna of Physical Therapy; Raelin, Joe of Work & Learning Center; Blackmer, Betsey of Bouve; Mabrouk, Patricia of Chemistry & Chem. Biology; Murrell, Peter of Education; Sherman, Tom of Math Schlosser, Ralf of Speech Lang. Pathology and Manning, Peter of Criminal Justice;. "POE Fellows: A community of practice dedicated to integrative teaching, Learning and scholarship."

Hardy, Yolanda of Pharmacy Practice. " To assess objectives and develop an assessment tool for a Problem-Based Learning (PBL) activity based on direct feedback from students."

Hoffart, Nancy; Dakin, Cynthia; Douglas, Brenda ;Corsetti, Joanne; Crispi, Patricia; and January, Cati of Nursing. "Academic Coaching for Bachelor's and Direct Entry Nursing Students"

Hosseini, Jean of Information, Operations. "Application of Bloom's Taxonomy and Piaget Model of Cognitive Processes to Teaching of Management Information Systems Concepts."

Jaeger, Beverly of Engineering. "Incremental Skill Development: Public Speaking & Technical Presentation in Engineering Design."

Kirwin, Jennifer; VanAmburgh, Jenny and Napoli, Kristyn of Pharmacy Practice; "Advanced Pharmacy Practice Experience + Service Learning: A Winning Combination."

Krasnow, Jean and Grose, Claudia of Education. "Community as Teacher: Urban Teacher Preparation at Northeastern University."

Mabrouk, Patricia; Peters, Kristen andPelligrini, Jared of Chemistry & Chemical Biology. "The Undergraduate Research Experience in Chemistry Defined."

McBride, David of Physician Assistant Program. "Student Case Presentation as a Teaching Method in the Didactic Portion of Physician Assistant Education."

Rivers, Jennifer of Earth & Environmental Sciences. "Using Campus Wells to Teach Groundwater Flow and Solute Transport."

Wallin, Bruce of Political Science. "A Federal Deficit Reduction Simulation: Learning Politics and Policy in a Budgetary Context."

Wang, Patrick of Computer Science. "3D Pattern Analysis and Teaching."

Weiss, James of History. "War and Memory."

Winston, Betsey of American Sign Language. "Discourse Mapping: The GPS of Translation."

Opening Remarks at the Scholarship of Teaching and Learning Symposium

- Jack Reynolds

As most of you know, academicians continue to debate the relative importance and value of teaching vs. research, usually presented attendant to discussions about promotion and tenure. Published reports from other research universities (e.g., the University of Michigan) where faculty have been successful in gaining tenure and being promoted based on the SoTL have fueled this debate. Many argue, and I agree, that we need to move beyond this debate and determine instead what it is to be a scholar.

Ernest Boyer, in his 1990 book *Scholarship Reconsidered: Priorities of the Professoriate*, called for an end to this debate in favor of a broader look at how we do our work. His defined four categories of scholarship: discovery, integration, application and teaching. Some have argued that we should not be seeking to broaden the definition of scholarship; rather, we should find the commonalities that exist among the various forms of scholarship. Indeed, all forms of scholarship have some common elements: a plan to address and issue, a problem or a question; the application of a system or method; and results and analyses that are held up for critical review among peers. Presentation of scholarship in the form of publications and lectures, for example, is necessary for the work to become recognized as such. Unfinished manuscripts and study results that sit in piles on faculty desks do not constitute scholarship.

In light of greater societal expectations in the area of teaching and learning, often framed under the term "academic accountability", educators are being encouraged implicitly, and sometimes explicitly, to regularly apply assessments and innovations in their teaching. This is evident in the increased emphasis that regional and programmatic accreditation groups are now placing on systematic assessment. As is the case at Northeastern, many universities have been focusing increasingly on the quality of teaching, and

providing evidence of such quality using systematic collection of information, rather than quantity of teaching. As many of you may know, just this week the Faculty Senate began a discussion about improving the infrastructure to address qualitative aspects of teaching at our university. This is very encouraging.

I'd like to present you with some questions that perhaps will frame some of our thinking:

- ❏ What kinds of scholarship are important at Northeastern in light of its mission and orientation?
- ❏ Are our practice and research orientations mutually exclusive in the context of scholarship?
- ❏ Will we be able to better define scholarship in relation to individual academic disciplines?
- ❏ How does teaching qualify as scholarship and what value should be placed on such scholarship in a research-intensive institution such as ours?
- ❏ How does such scholarship inform and improve teaching and learning?
- ❏ What is the tie-in of assessment to educational quality improvement initiatives?

There are many other kinds of issues and questions that we'd like to explore with you. It is clear that many good things are happening at Northeastern in the area of scholarship of teaching and learning.

Jack Reynolds is professor and chair of Pharmacy Practice, as well as chair of the CEUT Advisory Board.

On Scholarship:

"An intellectual is a person whose mind watches itself."

- Ken Hill

"All things are to be examined and called into question. There are no limits set to thought."

- Edith Hamilton

Teaching vs. Research – Rivalry or Synergy?

- Jeffrey A. Hopwood

Like the Yankees vs. the Red Sox, the question about the roles of teaching and research for university faculty is often posed using words reminiscent of a sporting event. It would not be unreasonable to suggest that the fans of teaching and the fans of research share some of the same animosity as sports loyalists! The very nature of the question suggests that one group will win and the other must lose. As Northeastern University moves toward Top-100 status, however, I believe it is important to break from the notion that teaching and research are opposing tasks that compete for our time. Instead, I would like to suggest that we view teaching and research as symbiotic activities with much in common.

In the table below, I show the progression of tasks associated with research and with teaching. In the remaining paragraphs, I will try to convince you that it is possible to become a stronger researcher and a better teacher by exploiting the parallels that exist between these two columns.

Research/Scholarships	Teaching
Identify Problems	Curriculum Development
↓	↓
Generation of Ideas and	Course Development
↓	↓
Proposal Writing	Classroom Teaching
↓	↓
Execution of Research	Practice-Oriented Teaching
↓	↓
Dissemination	Dissemination
↓	↓
Development of Expertise	Mastery of Teaching

The first step of the research process is the identification of a relevant problem. This requires both expertise and an awareness of the state-of-the-art in one's field. In teaching, curriculum development leads the process. The development of

a relevant curriculum requires – you guessed it – expertise and an awareness of the state-of-the-art in one's field. This parallel is at the heart of the modern research university. The research enterprise builds expertise and legitimizes the educational curriculum. At the same time, the mastery of teaching enhances the effectiveness of our research as we shall see in a moment.

One of the best parts of being a faculty member is the opportunity for creativity. Put simply, the generation of new ideas and solutions to problems is fun. If a central problem in teaching is "How do we cajole students to learn?" then course development is another creative opportunity. We frequently brainstorm with our colleagues while discussing research problems. Certainly teaching methods can benefit from the same collegial repartee.

Proposal writing is the attempt to convince our peers that we have developed a viable idea that deserves funding. A poorly guarded secret in proposal writing is that the proposal must inspire and excite the peer reviewer within the first page. If you fail to quickly make a relevant argument, the proposal is usually rejected. The similarity to classroom teaching is remarkable. In the classroom we have about 10 minutes to inspire and excite our students. If we fail to demonstrate the relevance of the course topic, the students tune-out as quickly as our peers! Both research and teaching can benefit from developing concise and effective motivating skills. Proposal writing and classroom teaching have the same goal: learning. Only the audience differs.

The execution of research is usually done in concert with graduate students. Graduate education within a research institution is basically an apprenticeship, and I would encourage administrators everywhere to formally recognize the intense effort involved in this form of teaching. In addition, we can enhance the undergraduate experience by including young students in our research programs. Again, the level of effort can be overwhelming and that extra effort must be included in a faculty member's workload calculation. The benefit of research experiences for undergraduate students who are contemplating graduate school is immense. The benefit of research-active faculty to this university is also critical: it provides the Practice-Oriented Educators for Practice-Oriented Education.

Dissemination of research results can be formal (e.g, publications) or informal, such as when it is the subject of conversation with our peers. Too often faculty ignore opportunities for the dissemination of the products of teaching. Sharing what we have learned about teaching either formally, through journal publications, or informally, by sharing of teaching materials and water-cooler conversations, is a critical part of teaching. In addition, the widespread peer-review of our disseminated research improves its quality. The peer-review of teaching is not only an informal mode of dissemination among colleagues, but should also be expected to benefit the overall quality of teaching.

From these brief examples I hope that you begin to agree that the core tasks associated with teaching and research are actually quite similar. The primary difference is the audience: "research" is focused on teaching our peers and "teaching" is focused on students. Each time we move through the parallel cycles shown in the table we increase our expertise, our academic reputation, and our likelihood for success in the future. By concentrating on the inherent synergies between teaching and research we can greatly enhance our professional growth and the effectiveness of the university.

Jeffrey A. Hopwood is Associate Professor of Electrical and Computer Engineering and a Teaching Excellence Award Winner. This article is based on his remarks at the 2004 "Winner's Circle" Symposium.

President Freeland addresses Winner's Circle attendees, while panelists look on.

An Evaluation Protocol for 21st Century Instructors

- Nicholas A. Gross and Paul Hickman

Background

There is much data, especially from the Third International Mathematics and Science Study (TIMSS) that analyzed classroom practice, to support the statement that "We teach the way we were taught" (Stigler and Hiebert, 1999). Recent education scholarship has shown that rather than continuing to use traditional, more passive class formats, institutions of higher learning should implement active-learning, inquiry-based and problem-solving strategies in introductory science courses. This means requiring students to develop hypotheses, to design and conduct experiments, to collect and interpret data, and to write about the results (Beichner, 2004). Revolutionary courses utilizing these methods have been implemented and assessed at a handful of institutions of higher education across the country. They have been proven to spark student interest in science, to help students, especially women and underrepresented minorities, learn more and get better grades, and to lead students to enroll in more advanced science courses (Handelsman, 2004). However, Handelsman, et al, also point out that university faculty have been slow to abandon the traditional lecture format and adopt the proven reform techniques.

In order for instructors at all levels to adopt sound teaching strategies leading to improved student learning, instructors must be both convinced of the effectiveness of active learning and experience these techniques in the university courses they take. One impediment to this adoption is that standard teacher practice evaluation instruments are difficult to apply in reformed classrooms, because the structure, content, and delivery style for many reform classes differs dramatically from the traditional lecture/demonstration approach. For example, in a reformed classroom there is little emphasis on lecture, so the instructor may not have an overt and easily observed opportunity to demonstrate their level of content knowledge or class preparation as measured by traditional evaluations. New assessment instruments are needed to evaluate reform classrooms that are centered on student learning and one such instrument is the Reformed Teaching Observation Protocol (RTOP).

The Tool

The RTOP was developed at Arizona State University as an observation instrument to provide a standardized means for detecting the quality of K-20 STEM (Science, Technology, Engineering, and Mathematics) classroom instruction. The instrument has very high inter-rater reliability, and high scores measured by RTOP have been shown to correlate well with increased student understanding in multiple studies (Lawson, 2002 and many others). The use of this protocol was highlighted through a commissioned paper for and presentation at the 2002 NRC Improving Undergraduate Instruction in Science, Technology, Engineering, and Mathematics Workshop.

RTOP observations are made in five categories: Lesson Design and Implementation, Content (Propositional Knowledge), Content (Procedural Knowledge), Communicative Interactions, and Student/Teacher Relationships each with five elements for a total of 25 items. Each of us attended a full-day workshop at a national AAPT meeting, led by Dan MacIsaac and Kathleen Falconer, to learn to use the tool.

This observational instrument provides an interesting alternative to the traditional evaluation form and better reflects the values of reform teaching as called for in current literature. Use of RTOP requires trained observers who have completed a workshop and co-observed classrooms or video to develop consistent use of the tool.

Our Application

Recently, one of us led a workshop called "Quantifying Classroom Instruction with RTOP" for secondary math coaches from CESAME's Massachusetts Mathematics Coaching Project (http://www.cesame.neu.edu). Our workshop was designed to: Develop an awareness for the RTOP as a research tool; practice using RTOP in a collegial supportive environment; improve objective observational expertise; and increase understanding of the meaning of the 25 RTOP items. Participants refined their ability to use the tool by watching video

of mathematics teachers, recording their observations individually, quantifying their observations using the rubric, discussing and justifying the scores to a partner and then coming to a group consensus on their RTOP scores. They then compared their consensus score to the expert score. The tool was needed measure and document changes in teacher classroom practice as a result of the ongoing coaching interventions. Stephanie Feger, from the Education Alliance at Brown University, who attended the workshop is now using RTOP observations with her colleagues to provide baseline measures of mathematics teacher behaviors in Florida.

The other author used the RTOP materials as a way to introduce instructors, particularly graduate students, to the delivery of a novel general science curriculum developed by the Embedded Learning Modules (ELMO) project here at Northeastern University (http://elmo.neu.edu). ELMO courses use a highly interactive classroom environment where students actively explore natural phenomena and engage in discussions with the instructor and other students. The RTOP training materials provide a common and rich reference experience with research-based instructional vocabulary for new and experienced instructors to begin discussing the value of the instructional model used in ELMO. Instructors viewed RTOP training videos, rated them with the RTOP instrument and then discussed the ratings for each item as a group. As new instructors learn and deliver the interactive curriculum, the work with RTOP provides a common language for them to discuss issues with more experienced instructors. In this way, new instructors not only gain experience teaching a novel curriculum, but they also have a set of principles and vocabulary provided by RTOP to evaluate that experience.

Conclusion

Use of the RTOP tool can provide the missing link between the instructor's behaviors and growth in student understanding. Evidence-based movements in medicine, crime prevention, and manufacturing have pointed the way toward continuous improvement in our educational practices. At the recent Education Summit, Secretary Ron Paige called for better research in education. He said:

"This is an area in which some progress has been made, but, for the most part, we're still blindfolded and trying to find our way through a cluttered room. Much more high-quality research is needed to determine what methods, resources and curricula are best for educating students at all grade levels."

We must assure that the teaching strategies we use are effective and that we have the evidence to support their use in the context where they are applied. Only then can we continue to add to the growing research base, remove our blindfolds, and help to move education more solidly into the culture of evidence.

An online version of the RTOP teacher workshop that we attended, with carefully edited and expertly scored video clips appropriate for physics classes, maintained by Buffalo State College is available at: http://PhysicsEd.BuffaloState.Edu/.

Nicholas Gross is Associate Director of the ELMO Project. Paul Hickman is Director of the CESAME Program.

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What it means to be a Great Teacher-Scholar

- Patricia Ann Mabrouk

I have dedicated my academic career at Northeastern University to the proposition that teaching and research are mutually synergistic – that to be an effective research scientist one must be both a talented educator and a skillful researcher. Some refer to this as the teacher-scholar model. I owe my success in science to the fact that my academic mentors all lived this belief system openly in front of me. Lives lived well speak louder and much more eloquently than mere words. I would like to share a few observations I have made over the years regarding great teachers – who they are, what they do, and what they are not. I also feel that I need to warn you up front that this won't be a top 10 list of things you can do if you want to be a good teacher. I don't believe it is possible to compile such a list nor do I believe it be wise or even useful to do so. Teaching isn't what you do. It is about who you are. I believe Parker Palmer, author of The Courage to Teach, stated this quite eloquently. He said: "Good teaching cannot be reduced to technique; good teaching comes from the identity and integrity of the teacher." Consequently what I would like to do is suggest is that there are some common characteristics that mark great teachers:

Point 1. ***Great teachers see the potential in their students.***

I know this from first hand experience. Miss Scott was my second grade teacher. I don't remember what she looked like but I know she was strong and beautiful in spirit. I know it because of what she did for me. One day that fall she gave every student an award. Mine said "Beautiful Brown Eyes." I still have it among my effects. I doubt she ever knew what she did that day but she transformed my life. The year was 1967 – the year of the six-day third Arab Israeli War (June 1967). My father was Egyptian and we lived in a Jewish neighborhood. Every day I faced ignorance, fear, and hatred at the bus stop. I hated going to school. Only because I knew Miss Scott was waiting there ready to open some exciting new door – some story to tell, some game to play, etc. – was it bearable. How I loved being in her classroom. Her secret - she made every student feel special. I wish I could tell you that subsequently I was a star student but unfortunately there weren't any "Miss Scott's" in my classroom life for a long time thereafter. And that is the problem and the opportunity for all of us as I see it. There are far too few Miss Scotts out there.

2. ***Great teachers know their job isn't about teaching at all but instead it is all about learning.***

My first, best teachers and mentors were my parents: my father, Dr. Ahmed Fahmy Mabrouk, a flavor chemist who worked at the Natick Army Research Laboratory, and my mom, Barbara Elaine Mabrouk, a former physical therapist with an earned Masters in Education who was a full-time, stay-at-home mother with three daughters. When I was a high school sophomore, my dad opened up his research laboratory to me for a science fair project. My goal was to develop an inexpensive meat substitute that could be used to feed everyone in the third world. So, I wanted to figure out what made meat taste like meat so I could use those chemicals to flavor soybean meal. My dad told me that the Maillard reaction, a complex reaction between sugars and amino acids that produces more than 60 products, was responsible so I reacted each of the twenty common amino acids with ribose (sugar) to see if I could identify which amino acid was responsible for meat flavor. My home economics class served as unwitting taste testers for the flavor mixtures I prepared. My mom and I then used the best ones to flavor soy protein which we stuffed into sausage casings. Admittedly the idea was naive, ambitious, and altruistic – to say the least – but it was creative, highly original, and it was mine. Certainly, the fact that I won a first prize at the Massachusetts State Science Fair for the project was exciting and encouraging but the pivotal aspect was the avenue I discovered wherein I could express my creative nature through scientific investigation and affect change in the world. All of a sudden science – chemistry - became alive for me; I was interested in what I was studying in the high school classroom because I could now see the relevance.

3. ***Great teachers open windows of opportunity for their students.***

I fell in love with Chemistry as an undergraduate at Wellesley College. There as a freshman I was blessed to meet my second mentor, Dr. Nancy Harrison Kolodny, herself a Wellesley College chemistry graduate. She offered me the opportunity as a mere freshman to prep the labs for the advanced physical chemistry course she taught each spring. I still remember the experience vividly as though it were only yesterday. She didn't treat me like a freshman. She didn't suggest that there were things I probably wouldn't be able to do or concepts that would be too difficult for me to understand. What just blew me away was that she trusted me enough to let me prepare the stock solutions that these junior and senior chemistry students would use in their experiments. I remember with great joy when she told me that my photographic plate would be used as her teaching model in the course that spring. I felt like a trusted colleague and because of that I gave her more than I ever thought that I had in me to give. The result I set the bar of my own expectations for myself higher. I started to have a vision for my own potential and I started to dream.

That summer, the following winter and throughout my junior and senior years I worked with Professor Kolodny on various projects – I learned to program computers on an Apple 2e creating a program that would allow Wellesley freshwomen the opportunity to practice reading the vernier on the analytical balances we used back then in lab. I read an early monograph on Fourier transform nuclear magnetic resonance and taught myself the basics of NMR theory. During my junior year I joined her undergraduate research group and became the first undergraduate to use the 500 MHz NMR at the Francis Bitter National Magnet Laboratory at M.I.T. The same year I also took an advanced elective in applied mathematics and a graduate course in Quantum Mechanics at M.I.T. My senior year, Professor Kolodny offered me the opportunity to be a lab teaching assistant for the General Chemistry course. It was the enthusiasm of my students for my stumbling efforts that semester that confirmed in me the desire to pursue a career in teaching although at that time I was not thinking of teaching at a university.

4. ***Great teachers don't just love teaching. They live teaching and are unabashedly passionate about it.***

By the time I was finishing my doctoral dissertation at M.I.T. – following in the footsteps of my undergraduate mentor- I was pretty sure that I wanted to obtain a teaching position at a university. This meant that I needed to first complete a postdoctoral appointment in a prominent research lab. I interviewed in a number of top labs in my field. Most of the faculty with whom I interviewed seemed to view me as a talented technician – a pair of hands that would come to their lab and apply the techniques I had learned in graduate school to their specific research problems. This wasn't what I wanted however. I wanted to learn new/different spectroscopic techniques and to delve into a field of chemistry that was new to me – bioinorganic chemistry. Only one person seemed interested in taking on a postdoc under these circumstances. Further complicating things was my desire to apply for an NIH postdoctoral fellowship. This is an appointment that young scientists who wish to pursue a career in academics typically seek because of the cache these appointments carry as being both awards and research grants. This unique individual who would soon become my postdoctoral mentor flew to Boston and spent a day working with me on my NIH grant application. When he returned home he followed the visit up with a lengthy phone call, helping me hone a very rough draft. I subsequently obtained the fellowship and went to work in his lab. I made my decision in part because of my interest in his science but primarily due to my conviction that this was a person who clearly cared about people and teaching – this looked like someone who mentored students. I wasn't wrong. His lab was a magical environment – I often tell people in conversation that my postdoctoral years at Stanford were the two best years of my life. It is no exaggeration to say this. My postdoctoral advisor, Professor Edward Ira Solomon, loved science and he loved students – postdoctoral, graduate, and undergraduate – he welcomed anyone who loved chemistry into his lab. He worked in the lab six days a week and was constantly in the lab planning experiments, discussing results, writing papers. He clearly viewed each student as a valued colleague. I am convinced that this trust brought out the very best in each of us. Recently he won a major research award from the American Chemical Society. I visited his web page and wasn't at all surprised to learn that nearly twenty of his past research students are now distinguished faculty members at respected colleges and universities quite literally around the globe.

5. ***Great teaching is a gift with far greater impact than is ever fully realized.***

I would like to offer myself and share some of what I have done as a teacher since coming to Northeastern as an example of the enormous impact/good fruit from the tree sown due to my mentors' efforts and which is now in turn beginning to bear its own fruit.

Because participation in high school science fairs and undergraduate research (UR) were pivotal experiences for me as a young woman, I have made every effort to

involve talented young people - especially students from underrepresented groups - in my own graduate research program as early and as long as possible. To date eighteen minority high school students and thirty-eight undergraduates from a wide range of college majors and several academic institutions have worked in my laboratory. My students have won a number of awards, presented 17 presentations, and together we have published 12 peer-reviewed papers – this accounts for nearly 1/3 of the 38 peer-reviewed publications that have come out of my research lab over the past fourteen years to date. I am really proud of the fact that a large percentage of my research students have been women: 62% of my undergraduates and 78% of my high school students. All of my high school mentees have successfully graduated from high school and have matriculated at area colleges and universities.

Because I believe UR has limitless potential to transform and empower young people, in recent years, I have endeavored to define and articulate a pedagogical framework to ensure that all interested students are provided with quality undergraduate research experiences. An important ongoing effort in this regard has been my effort to undertake a national study of undergraduate research. I was surprised to discover that there is very little information available in the science education literature about the undergraduate research experience - either how to involve students or how to ensure that the research experiences are meaningful to students. Therefore, I initiated an educational survey study of a number of past and present undergraduates across the country, who have been involved in undergraduate research experiences in order to identify what factors are important in designing a "successful" undergraduate research experience. In 1999-2000, Biology major Kristen Peters and I looked at undergraduate research nationally from a student perspective. Our findings have been summarized in a paper published in the fall of 2000 in the CUR Quarterly. Subsequently I collaborated with undergraduate Jared Pellegrini, a Northeastern University computer science major, on the second phase of this study in which we examined UR from a faculty perspective. Results from this study have been reported at several national meetings. With recently approved funding from the National Science Foundation Division of Undergraduate Education, I plan to use the insight I have gained from these studies to develop a web-based mentoring resource nick-named Web-GURU (Guide to Research for Undergraduates) to assist undergraduates and their faculty mentors at colleges and universities across the country successfully navigate the undergraduate research experience.

I would like to close by sharing a favorite story of mine from "Chicken Soup for the Soul."

A man was walking down a deserted Mexican Beach at sunset. As he walked along, he began to see another man in the distance. As he grew nearer, he noticed the local native kept leaning down, picking things up and throwing them into the water. Time and time again, he kept hurling these things into the ocean. The man walking down the beach was puzzled. He approached the native and said: "Good evening, friend. I was wondering what are you doing?"

"I'm throwing these starfish back into the ocean. You see, it's low tide right now and all of these starfish have been washed up onto the shore. If I don't throw them back into the sea, they'll die here from the lack of oxygen."

"I understand", the man replied, "but there must be thousands of starfish on this beach. You can't possibly save all of them. There are simply too many. Don't you realize this is probably happening on hundreds of beaches up and down the coast. Can't you see that you can't possibly make a difference?"
The local native smiled, bent down, and picking up yet another starfish, and as he threw it back into the sea, he replied, "Ah! But I made a difference to that one!"

Patricia Ann Mabrouk is Professor of Chemistry and Chemical Biology. She has been named the Carnegie Foundation Massachusetts Professor of the Year. This text has been excerpted from Professor Mabrouk's address at the third annual Teaching Assistant Recognition Banquet.

More on Scholarship:

"Better to understand a little than to misunderstand a lot."

- Author Unknown

"It is by teaching that we teach ourselves, by relating that we observe, by affirming that we examine, by showing that we look, by writing that we think, by pumping that we draw water into the well."

- Henri-Frédéric Amiel

The purpose of the Jonas Chalk "Chalk Talk" column is to initiate a dialogue on best practices, successes, and frustrations in teaching. This column hopes to stimulate, engage and occasionally nudge professors to share their wisdom and ideas about the best ways to achieve outstanding learning outcomes. Readers can submit letters, questions, or ideas that you have to jchalk@coe.neu.edu.

Recent Jonas columns can be accessed at: http://gemasterteachers.neu.edu/documents/documents.html

If you would like to subscribe to the weekly Jonas e-column, contact Jonas at jchalk@coe.neu.edu with your e-mail address and put "subscribe" in the subject line.

Dear Jonas,

In both of the classes that I'm teaching, I have a sort of uneasy feeling that the students just aren't getting much out of class. They sit there very quietly every day, only speaking when directly called upon. When I ask if I'm covering the material too quickly or slowly, if they're finding the course difficult, how they like the textbook, or simply how things are going in the class in general, they respond unenthusiastically with "okay" or "fine". Maybe the classes really are okay, but I'm not sure. How can I get some more constructive feedback from my students?
Uneasy Instructor

Dear Uneasy Instructor,

I understand your plight. I think that anyone who has taught for a number of years has had classes like yours, classes that just don't feel right, and most of us have experienced the struggle involved in convincing students that we really would appreciate constructive criticism.

However, the good news is that there are fairly simple, effective mechanisms for obtaining constructive feedback from your classes: the one-minute paper and a midterm assessment form (MAF).

The one-minute paper is a quick, simple way to get on-going feedback about the class. The technique is simple. At the end of class, you ask students to answer a couple simple questions anonymously on a 3x5 card. For example, you might ask: (1) what was the main idea/concept/operation you learned today, (2) what questions do you still have about today's class and/or (3) what feedback do you have for the instructor. You can do this after every class, once a week, or whenever you feel it's necessary. This will allow you to "have your finger on the pulse" of the class and make timely adjustments where necessary.

An MAF is a short document, which you distribute to your classes around the middle of the term; it is a formative document meant to provide the type of feedback that can help shape the class for the remainder of the term. Typically, one would take ten minutes at the end of one class, hand out the MAF's, wait for the students to finish them, collect the forms, and read them almost immediately. It is extremely important to inform the students beforehand as to exactly what the MAF is, and to be clear that you are going to read their comments immediately. It is also important, after reading the MAF's, to tell the students about any course changes that you plan to make as a result of their comments. I have attached a sample midterm assessment form - a Microsoft Word document. You may wish to use it, or you can create your own. If you create your own, I suggest that you keep it short and simple.

For more comprehensive mid-term feedback you may want to contact the Center for Effective University Teaching. They have a mid-semester feedback program called Small Group Instructional Diagnosis (SGID). This process is particularly helpful if you feel that there are conflicting student expectations for the class, because this process forces students to talk to each other and to discuss the student role in the learning process. (Please contact the CEUT for information on scheduling and class size specifications, if you think you may be interested in this program. You can also find information at: http://www.ceut.neu.edu/sgid.htm) Perhaps some of the questions on the SGID form would be appropriate to use if you create your own midterm assessment form.

I should make it clear that an MAF has a different purpose than the standard evaluation forms, which we distribute near the

end of the term; evaluations are summative documents intended to rate the instructor and the course. The midterm assessment forms are totally different - they are designed solely to help the instructor make mid-course improvements.

You can also collect mid-term feedback anonymously by creating a survey in Blackboard. Step-by-step instructions can be found on the EdTech Center's web site at http://www.edtech.neu.edu/blackboard/resources/.

Good luck,
Jonas

Quick Tip: After reviewing any MAF comments, be sure to talk to the class about any constructive suggestions you found to be helpful or why some suggestions can't be implemented.

FUTURE EVENT!!!

The Center for Effective University Teaching will hold its annual "Winner's Circle" Symposium, to honor and recognize faculty who have won the Excellence in Teaching Award. This year's theme will be "Issues in Grading: Measuring Learning", to be held on

March 30, 2005

All Northeastern University faculty are invited to attend

For more information, please contact check your e-mail as the date nears.

To view a list of past winners, please visit
http://www.ceut.neu.edu/awards.htm

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Director, Donna M. Qualters - Editor-in-Chief
Associate Director, Miriam R. Diamond - Editor
Graduate Assistant, Kuheli Dutt - Co-Editor
Evaluation Coordinator, Audrey Aduama - Photographer
Administrative Assistant, Kristen Jacquard - Layout & Design
Administrative Assistant, Cynthia Sanders - Contributor
Administrative Assistant, Nona V. Howard - Proofreader

Phone: 617.373.8583
Fax: 617.373.7531
WWW.CEUT.NEU.EDU