

Newsletter

Department of Chemistry

Cleveland State University

And

Cengage Publishing



*General Chemistry
2012 Spring Symposium*

March 16, 2012



Introduction

What teachers, whether faculty or part-time instructors, have a more challenging task than laying down the foundations of a general chemistry course? A general chemistry symposium offers a forum for the teachers from either large lecture halls or small classrooms to meet, listen, and discuss both the successes and difficulties of their experiences.

This spring, marked Cleveland State University's Department of Chemistry's first General Chemistry Symposium. In attendance were faculty and instructors from twelve of Ohio's leading universities, colleges, and community colleges. Of the two guest speakers, John Kotz's talk entitled Writing Textbooks for the twentieth Century started the morning program. Dr. Kotz, a world renowned educator, has published 14 textbooks, of which his general chemistry text has been read by over one million students. Andrew Jorgensen, who has lectured and written extensively on the chemistry of climate change addressed the subject, Sustainability: Not just Another Addition to our Syllabi. During his talk, Dr. Jorgensen added an interactive dimension to his presentation by passing out clinkers to the audience. Dr. Jorgensen, a Senior Fellow of the National Council for Science and the Environment, and Councilor for Toledo Section of the American Chemical Society, has served as an Editorial Board Member for the Encyclopedia of Earth since 2008.

Throughout the symposium topics of other speakers covered interests from research experience to enhance learning (REEL) to eLearning technologies and standards in distant learning to math remediation methods. An example of eLearning technology was incorporated into the afternoon panel discussion when one of the panelist, Jerry Overmyer made his presentation from Colorado using the interactive Wimba program.

At the end of the newsletter, several questions are presented to our readers regarding not only feedback about the first spring symposium, but also ideas concerning subjects and activities for future symposia.

By fall 2012, announcements for the next General Chemistry Symposium will be sent out. Since the planning for the first symposium allowed us only one month advance notice, we intend, with more time, to attract a larger number of attendees and presenters.

Hope to see you in Spring 2013!!

For more information contact

Jerry Mundell, j.mundell@csuohio.edu

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WELCOME



Dr. Michael A. Gates

Associate Dean , College of Science and Health Professions and Interim Chair, Department of Physics, Cleveland State University



Dr. David Anderson

Chair, Department of Chemistry, Cleveland State University



Dr. Jerry Mundell

Director of Freshman Chemistry, Department of Chemistry, Cleveland State University

Ms. Barbara Adams **Cengage Learning**



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John C. Kotz

Chemistry Textbooks for the 21st Century



John Kotz was born in northern Ohio in 1937. He graduated from Washington and Lee University in 1959 with a B. S. degree in chemistry before earning a Ph.D. in inorganic chemistry at Cornell University in 1963. From 1963 to late 1965 he was a National Institutes of Health postdoctoral fellow at the University of Manchester

in England and at Indiana University. In 1965 he joined the faculty of Kansas State University before moving to the State University of New York, College at Oneonta in 1970. He retired from SUNY in 2005 as a State University of New York Distinguished Teaching Professor of Chemistry. In addition to research papers in organometallic chemistry, he is the author or co-author of 14 textbooks for chemistry, among them an advanced book for inorganic chemistry and a general chemistry text. The latter, which has been used by over 1 million students, is also available as an ebook and has been translated into five languages. Among his honors are a Senior Fulbright Fellowship; the SUNY Award for Research and Scholarship; the Catalyst Award from the Chemical Manufacturers Association; and named lectureships at UNC-Asheville and the University of

South Dakota. Now retired, he is an avid photographer and traveler. He continues to write textbooks and chairs the committee on environmental science for the Kiawah Island Conservancy in South Carolina.

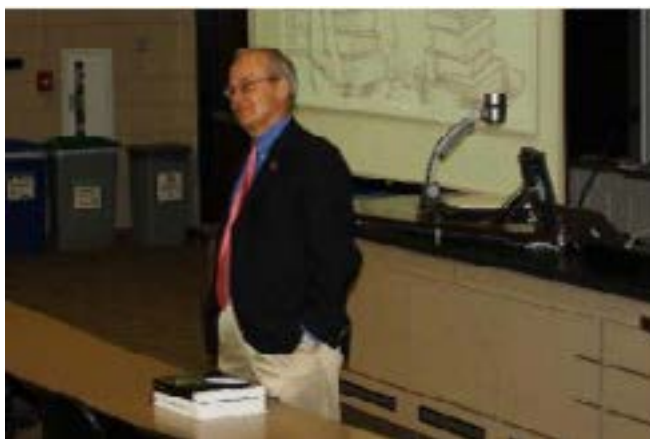
Presentation

Writing Textbooks in the 21st Century

An article in *Change* magazine in 1992 stated that “textbooks have never been more beautiful, sophisticated or useful” and that “the textbook ‘package’ is the premier vehicle for teaching and learning.” It also stated, however, that some students have the attitude that “textbooks are simply utilitarian commodities, to be purchased only when absolutely necessary ...”. But much has changed in the last 20 years, with the design and function of books changing rapidly and in yet-unknown directions. This talk focused on various ways in which college textbooks are now being made available, including rental programs, hybrid books, open-education resources (called OER books), and electronic books. The features of the YouBook, an electronic version of *Chemistry & Chemical Reactivity* (8th edition, Cengage), were described in particular. These included embedded audio/video tutorials, interactive quizzes, highlighting and note taking functions, and the possibility for instructors to revise text.

For more information about Dr. Kotz contact:

<http://www.oneonta.edu/faculty/kotzjc/JCKHome.html>



Dr. Anne O'Connor

The REEL Teaching Experience



Anne O'Connor received her Ph.D. from CSU in 2006. During this time, she has taught courses in freshman chemistry, analytical chemistry and physical chemistry at CSU, Baldwin Wallace, and Cuyahoga Community College. For the past four years, Dr. O'Connor has directed and taught the REEL Chemistry program at CSU. In 2010, Dr. O'Connor's dedication and skill in

teaching were recognized with an award from the CSU chapter of AMSA. Dr. O'Connor and her husband, Dr. Jerry Mundell, have also been active over the years doing chemical demonstrations at Cleveland's Ingenuity Festival and area elementary and middle schools.

Presentation

Real Experiences Through REEL Chemistry

A quiet revolution is taking place in the Chemistry Department at Cleveland State University. Each semester, more and more students are participating in lab courses taught by Dr. Anne O'Connor that go by the name Research Experiences to Enhance Learning (REEL) General Chemistry lab and REEL Organic Chemistry lab. In contrast to traditional chemistry lab courses where students perform lab exercises and submit lab reports with a known outcome, the approach of the REEL method of lab teaching is to have students, work independently and collaboratively, develop, pursue and implement their own research projects. Since most of these students lack any sort of research background, guidance and instruction that include literature searches, instrument instruction, data acquisition, data analysis, and presentation of research results are provided for each of the projects. By the end of the semester, each group of students present a poster of their research at a REEL Chemistry Conference sponsored by one of the participating universities or at a regional American Chemical Society (ACS) meeting. The result of such engagement is readily apparent in the students' enthusiasm, pride, and commitment in their projects.

REEL Chemistry first arrived at CSU five years ago through the support of a National Science Foundation grant, co-written by Dr. Robert Wei of our Chemistry Department. Over that time, fifteen other Ohio Universities have also participated in this new and effective approach to teaching which is redefining the lab experiences at CSU. Since Dr. O'Connor started directing the students in the REEL courses three years ago, she has guided and overseen the original research of students regarding such topics as arsenic and chromium content in wooden playground structures, polychlorinated biphenyl (PCB) toxicity, bioremediation of PCBs by oyster mushrooms, heavy metal concentrations in community gardens and brown field sites around the Cleveland area, lead concentrations in the vicinity of gun ranges and roadways, and the occurrence of polycyclic aromatic hydrocarbons (PAHs) in cooked foods, sealed coated parking lots, and motor oils as well as the toxicity of PAHs and heavy metals on *Vibrio fischeri*.

Instructing a REEL lab takes full commitment. Instead of a single traditional lab exercise each week, the activities of the REEL labs keep Dr. O'Connor and two teaching assistants, Mr. Nick Pallas and Mr. Bhagya Gunasekera, very busy. Outside of lab, Dr. O'Connor, Bhagya, and Nick frequently meet with students to give them guidance and instructions on their projects.

In the REEL labs, students quickly learn the importance of teamwork and collaboration. They develop critical and creative thinking that builds confidence as well as knowledge--all valuable skills in today's areas of research. Since these are original research ideas the students take ownership of their projects. In a traditional lab course the "experiments" are usually exercises with known outcomes. In REEL lab, since students are working on actual research projects, the outcomes are unknown. This provides the students with a sense of discovery and knowledge.

For more information about REEL Contact :

Anne O'Connor, Ph.D.

anne3266@aol.com

Symposium Student Presentations

Alex Butler and Dana Nunez presented “*Phthalate Leaching in Water.*”

Jaelyn Johnson presented “*Heavy Metal Leachates found in Playgrounds and Tire Dumps.*”

Zachary Kordelski presented “*Vetiver Grass for Bioremediation.*”

Danielle Meadows and Joshua Hellsing presented “*Identification of increased Bovine IGF-1 levels in dairy whole milk.*”

Previous Student REEL Projects

Ms. Elizabeth Looney
Northeastern Ohio College of Medicine



“As a post-baccalaureate student at CSU, I was both hoping to apply to medical school and had little hands-on research experience in the sciences. As any pre-med hopeful can identify with, this was quite a predicament! REEL lab was the perfect opportunity for a student new to the sciences to participate in hands-on research. In fact, I appreciated the course so much, I took both the General and Organic

REEL labs under Dr. O'Connor's supervision. I am deeply grateful to Dr. O'Connor, the CSU Chemistry department and the REEL program for allowing me to learn about chemistry research in an entirely new way, work on relevant environmental issues and experiment, well, with experimenting! REEL was a memorable element of my CSU education.”

Abstract

Detection of Polyaromatic Hydrocarbons in Organic Coffee Samples

The current study looked at the formation of polycyclic aromatic hydrocarbon (PAH) formation in coffee beans

as a result of the roasting process. PAHs, induced during roasting at high temperatures, were hypothesized to increase in concentration over time. Three PAHs were tested for: anthracene, benzo[a]pyrene and pyrene. Anthracene concentration was found to increase initially during roasting, then decrease after 10 minutes. Benzo[a]pyrene data was deemed inconclusive, most likely to be below detectable limits. Pyrene appeared to decrease in concentration over time, in contrast to established findings, which led to suspicion about the actual identity of the substance identified. A discussion on PAH identification in coffee as well as GC-MS limitations as a method for identifying PAHs is included.

Ms. Kate Gibbons

Virginia Tech-- Virginia College of Osteopathic Medicine



“I came back to CSU as a post-baccalaureate because I heard about the REEL program. I valued my undergrad thesis experience, and was excited to explore research in chemistry. The best part was presenting my project at the 241st National ACS Meeting in Anaheim,

CA. I exchanged ideas with chemists I met, and made revisions to strengthen the project's internal validity, continuing it the following year. Researchers and admissions people were impressed with my self-directed study and valuable skill-set.”

Abstract

Method for Assessing the Toxicity of Non-Arclor 3,3'-Dichlorobiphenyl (PCB 11) Using *Vibrio fischeri*

Recent research has revealed PCB 11 to be ubiquitous in the environment as well as consumer products. As such, there is a concern regarding the possible toxicity of PCB 11. Bioluminescent bacteria, *Vibrio fischeri* (previously used in chemical toxicity studies) are used as a bioassay, to test the hypothesis that non-Arclor PCB 11 will adversely effect the growth (optical density) and luminescence of *Vibrio fischeri* versus the untreated condition. Preliminary results suggest an inverse relationship between the variables that merit further investigation.

Mr. Anthony Kestranek
Case School of Dental Medicine



"I have gained research skills that have been, and will continue to be, extremely useful. Being a part of REEL lab has given me an opportunity to show graduate schools that I have the skills necessary to become a part of and thrive in their program."

Abstract
Measuring Perfluorocarbons (PFCs) in Industrial Waste Water

PFC's enter water in the environment when electroplating and metal stamping companies dump waste into water reservoirs near factories. These chemicals are carcinogenic and have been known to cause many health problems when continuously ingested. This project planned to use HPLC to separate out suspected PFC's in sludge. However, our standard solution would have indefinitely altered our HPLC column. We were unable to dissolve our solid standard except for in water. However GCMS cannot work with water. Because we were limited in materials, there was no room for experimenting with different methods. This experiment has taught me that not every chemical analysis goes as planned, but can still be a valuable experience in trouble-shooting and the empirical process.

Ms. Courtney James
Meharry Medical College, TN



"REEL Lab allowed me to get hands on lab experience that I would not have normally gotten in a typical lab class. I liked the program because I was able to explore a scientific question that I came up with, and it allowed me to fully understand the research process. I feel that REEL not only enhanced my undergraduate experience, it gave me a full sense of what real research

is like on a graduate level."

Abstract

Styrene Migration into Food Simulating Substances After Microwaving

Styrene (ethenylbenzene or vinyl benzene) is a naturally occurring organic compound, found in various fruits, spices, nuts and meat in small amounts. It is a toxic chemical, and exposure to styrene can result in damage to the central nervous system. Additionally, it has been identified as a possible human carcinogen. Styrene is used to form polystyrene, and is widely used across the world in a variety of applications in construction, packaging, food service, household products, and more. Studies have shown that it is safe for polystyrene to be used in food contact applications, and is approved by the U.S. FDA for this purpose. There is limited data on degradation of polystyrene into styrene and migration into food, however one Japanese study showed that styrene migration does occur in polystyrene packaged instant foods. The objective of this study was to evaluate the migration of styrene from polystyrene containers in a widely used instant heating application.



For more information about CSU's REEL program contact:

anne3266@aol.com

Mr. Daniel Grundei
Digital Solutions Manager
Cengage



Daniel Grundei is a Digital Solutions Manager for Cengage Learning, and for the past four years has worked with schools across Ohio and Western Pennsylvania to help faculty integrate technology into their Math and Sciences courses.

Prior to Cengage Learning, Daniel worked at CBS Interactive in San Francisco, CA as a Product Manager for their online gaming division. In this role he worked closely with software developers and user-interface experts to create online applications and games across the world's largest online gaming media website. Daniel currently lives near Cincinnati, OH with his wife and three children, and in his spare time enjoys coaching youth basketball.

All of these resources come integrated in OWL, the most widely used online homework system for Chemistry.

For more information about OWL and the new YouBook, please visit:

<http://www.cengage.com/owl/>



Presentation
Creating a Personal Learning Path with
Digital Resources

As faculty, it is essential to find new and creative ways to interactive with today's students. Integrating digital resources into the course needs to be done in a thoughtful way which enhances the learning experience for the students, and most importantly make it personal to them – not just as a way to get out of grading homework. With the latest release of OWL & the YouBook from Cengage Learning, faculty can now create a Personal Learning Path, and interact with students directly through the text. Faculty can rearrange chapters and sections of the digital text to align with the syllabus. Faculty can edit and/or delete text to make sure the wording of each sentence is meaningful to students. Faculty can add notes and highlights directly at point of reference for the students to help identify key concepts more clearly. Faculty can integrate outside media assets to make the content more meaningful, and at point of reference to help students connect more schemas in the brain. In addition, many of the diagrams, images, and strategy maps have been converted from static on-page content to dynamic, interactive media assets – giving the students the ability to actively participate in their learning experience.



From left to right: Shelly Tommasone, Danielle Grundei, and Barbara Adams from Cengage Learning.

Dr. Andy Jorgensen
Associate Professor of Chemistry and
Environmental Science
Director of General Chemistry, University of
Toledo



Professional Background:

B.S. 1970, Quincy College
 Ph.D. 1976, University of Illinois at Chicago
 Visiting Assistant Professor 1976-77, University of Illinois at Urbana Champaign
 Assistant Professor, 1977-81, Associate Professor 1981-85, University of Southern Indiana
 Visiting Researcher, 1983-84,

Ecole Polytechnique, France

Assistant Professor, 1985-88, Allegheny College

Washington Fellow, Council of Scientific Society

Presidents, 1994-95

Councilor for Toledo Section, American Chemical Society, 2001-present

Senior Fellow, National Council for Science and the Environment, 2008-9

Editorial Board Member, Encyclopedia of Earth, 2008-present

Presentation

Sustainability: Not Just Another Addition To Our Syllabi

This talk was originally prepared for the American Chemical Society's national meeting in San Francisco, March, 20110, as part of the Sustainability in the Chemistry Curriculum: What, Why Now, and How Symposium. In preparation for that symposium I posted a question about how sustainability could be part of the chemistry curriculum on the ACS network and received a large number of replies.

The first section of this talk is a summary of these comments from a number of the posters. Their comments included excellent ideas. I direct the reader to the discussion board for details. Some of the ideas were:

- Allen Doyle of UC Davis, who was one of the posters that used the term "lens" as a metaphor for sustainability, suggested that one pick a lab that is relevant to an industrial process and evaluate it in terms of the principles of Green Chemistry;
- Thomas Burns noted the value of including ethical considerations in courses;
- Paul Comet listed specific experiments that would be appropriate for the topic, including a reaction with newspapers;
- Cathy Middlecamp of U Wisconsin-Madison stated that she believed our children and grandchildren will be asking us what we did to ensure the sustainability of our lives, which provides a particular motivation.

In a separate communication, Bob Peoples, director of the ACS Green Chemistry Institute, summarized these thoughts by saying that a linear extension of present practices will not meet the needs and demands of the world's increasing population, so changes in our training of future chemists are necessary. I added the threat of global climate change, which was brought home by data from NASA which included that 2010 was tied for the warmest year since modern records were kept.

Special additional resources included in my talk were:

- The Green Chemistry website at the University of Oregon (<http://greenchem.uoregon.edu/>)
- The Chemistry in Context (McGraw-Hill) book for liberal arts chemistry courses developed by ACS using a team led by Cathy Middlecamp.
- The Chemistry of the Atmosphere and Nuclear Chemistry chapters of general chemistry books.

The talk included some specifics of the latter two. The Chemistry in Context web page has links to various resources that can help make the subject concrete to students, as well as raising discussion topics that

stimulate student thinking along these lines. The former includes NASA data for ozone concentrations and DOE records on carbon dioxide emissions. The latter includes questions of nuclear power and information on water use. For general chemistry courses the subjects of the mechanism of ozone layer destruction and urban pollution formation are very appropriate.

A major part of my talk, and the subject that I think is at the topic of the list when making the case for sustainability is climate change. As I do in my talks to professional and public groups at the CSU symposium I used personal response devices to elicit audience opinions as well as guesses on factual data. Invariably the results indicate that most people greatly underestimate the change in carbon dioxide concentration since the start of the industrial age as well as the average emission levels of this gas by those in the US. It is my hope that these surprises help the motivation to personal action. I included a number of opinion questions, such as the level of support for more nuclear power (very strong in almost all of my talks) and the person's willingness to make changes in their life style (generally accepted).

One means I use to make the concept more personal is to show a plot of carbon dioxide concentration and superimposed the values for the years in which my mother, I, my son and my granddaughter were born. These range from 302 to 386 ppm, which I believe should make the strong case for "paying attention" to the problem. Although not used in this talk, in other forums, I include a slide which predicts values of 550-900 ppm in the year 2100, which coincides with my granddaughter reaching the approximate age of her great-grandmother, so not so far in the future that we can ignore it.

I also have slides on the differences in carbon dioxide produced by various light bulbs (CFLs produce only 20% of the amount by incandescent bulbs), recycling aluminum cans versus making a new one (about 19 recycled cans or 1 new can produces 25 L) and the relative amounts of the gas emitted in producing various types of meats (beef is 7.6 times that of chicken).

I close the talk with a description of an online learning resource on climate change which is being developed by a team associated with the National Council for Science and Environment where I hold an appointment of senior fellow (CAMEL <http://www.camelclimatechange.org/>). We have been funded by NASA and NSF for this work. Readers are encouraged to review the material and offer their comments and resources.

Instilling sustainability is an imperative for all of us who teach science. One tool to assist in this quest is a volume that came out of the symposium. Cathy Middlecamp and I served as co-editors on the book: Sustainability in the Chemistry Curriculum, American Chemical Society Symposium Series, December, 2011.

Readers who are interested may request a copy of my slides using the following email address:

andy.jorgensen@utoledo.edu

I offer my appreciation to Jerry Mundell for organizing this program and inviting me to share my ideas with the group.

<http://www.utoledo.edu/nsm/chemistry/people/Webpages/Jorgensen.html>



Mr. Chris Rennison
Senior Online Media Instructional Designer,
Center for Online Teaching, Cleveland State
University

Presentation

eLearning: The Right Tool for the Right Job



Chris Rennison showcased a number of technologies that enhanced the delivery of online classes at Cleveland State University. Some were being used asynchronous courses, others synchronous.

Technologies ranged from the Wimba application which allows real-time interactions with instructors during class, to the digitizing of whiteboard writing into pdf files through Mimeoteach to the posting of "pencasts" which provide recorded paper pad writing with audio also as postable pdf files. The focus of Mr. Rennison's presentation was "each online class and technology pairing was featured within the context of "using the right tool for the job." An additional point of this technology is it's ability to be incorporated into traditional teaching to enhance the learning experience of the students.

For more information about Chris Rennison's presentation contact:
c.rennison@csuohio.edu

Ms. Sarah Rutland
Quality Matters



Sarah Rutland is the Manager of Operations and Quality Assurance in the University's Center for Instructional Technology and Distance Learning. Among other responsibilities, Ms. Rutland is the University's Quality Matters (QM) Institutional Representative and is responsible for the QM Initiative at CSU. In 2011 Ms.

Rutland was part of a research team awarded one of four national grants evaluating the impact of Quality Matters course revision on withdrawal rates and has given presentations on their findings at state and national conferences. In

addition to quality in online education, Ms. Rutland's interests include diversity in higher education and mentoring first year students. Ms. Rutland was drawn to the field of eLearning because she believes distance learning makes higher education more accessible to those who may otherwise not be able to pursue it.

Presentation

Quality Matters

Sarah Rutland discussed the Quality Matters Program and Cleveland State's involvement with the national organization. Quality Matters (QM) is a faculty-centered, peer review process that is designed to certify the quality of online and blended courses. At the core of the Quality Matters Program is the fully annotated Quality Matters Rubric, the centerpiece of a continuous improvement model for assuring the quality of online courses through a faculty peer review process. The QM rubric is composed of eight general and 41 specific research-based standards of quality course design. Cleveland State University, and many other institutions in Ohio, are members of the Ohio Quality Matters Consortium and ascribe to Quality Matters design standards when developing online and blended courses. Faculty members are invited to be a part of the process and to become Certified Peer Reviewers.

For those interested in learning more about QM contact:
s.rutland@csuohio.edu
 or call (216) 802-3147.

Dr. Carol King Phillips-Bey
Panel Moderator



Professor Carol King Phillips-Bey has been a member of the Mathematics faculty at Cleveland State University since 1993. Her area of expertise and teaching focus is on developing mathematics curriculum and math teacher preparation that improves teaching and learning of math and science at the kindergarten through college levels. She has been a repeat

presenter for professional conferences of mathematics and science teachers in Northeast Ohio, with an emphasis on achievement of underrepresented minorities. These include: the Northeast Ohio Center of Excellence

(NEOCEx), The Research Council of Mathematics, and the Ohio Board of Regents.

Dr. Phillips-Bey has served as project evaluator or project effectiveness consultant for multiple projects including Northeast Ohio Model Schools Initiative (NOMSI), and Teacher Enhancement in Elementary Mathematics (TEEM). Prior to her university faculty appointment, Dr. Phillips-Bey served as a high school and middle school mathematics teacher in Cleveland Heights, East Cleveland, and Oakland California.

She is a member of both the National and Ohio Councils of Teachers of Mathematics; the Ohio Mathematics Academy Program Advisory Team, and the NEOCEX Management Team. She holds a doctoral degree in Curriculum and Instruction Mathematics Education from Kent State University, a Master of Arts in Mathematics from Cleveland State University, and a Bachelors of Arts in Mathematics from Wesleyan University.

Dr. Ellen Mulqueeny

Summation of Panel Discussion

ALECKS

Upon completion of her undergraduate degree, Ellen began working in industry as a Civil Engineer. Three years later, she returned to Cleveland State where she completed her post baccalaureate degree program in teacher education. After teaching in several years in the K-12 environment, Ellen returned to school earning a degree in pure mathematics at the graduate level. From here, she began teaching at the collegiate level as an adjunct professor at Lakeland Community College and Cleveland State University.

Currently, Ellen is an Assistant Professor at Baldwin Wallace College in Berea, Ohio where she is the coordinator for the core mathematics courses taught at this institution. Ellen's research interests have provided her opportunities to participate in programs that target difficulties first year college students experience in mathematics.

Ellen lives in Painesville, Ohio with her husband Doug. She enjoys skiing and is an active member in the National Saki Patrol serving as section chief for the Ohio region of this organization.

Math Remediation in General Chemistry

by **Dr. Ellen Mulqueeny**

Knowing who is coming to college has important implications for today's professoriate. They must address a changing student body whose experiences, cultural backgrounds, and learning styles may be significantly different from views held by current faculty members. Today's students are very different from students of previous decades, not better or worse just different. This generation of traditional college age students sometimes referred to as "millennial's" poised to make their debut into academia are products of a "movement against criticizing children too much for fear of damaging their self-esteem" They arrive on campus with a healthy self-esteem that is more than likely a product of what they have been told than what they have accomplished and they react swiftly when demands of college coursework collide with their realities. They are able to cite multiple reasons why it is not their fault for their lack of progress or inability to keep up with course work and expect accommodations. While faculty are quick to complain that students are not the same as previous generations are they willing to understand these differences and make necessary changes to meet them where they are developmentally?

As post-secondary instructors face increasing numbers of under prepared students in their classrooms, recent efforts to improve secondary mathematics education have not yet been realized in our nation's universities, colleges, and two-year institutions. Sources from American College Testing Board (ACT) report that results from the spring 2007 college entrance exam showed the gap is widening between what high school seniors know and what colleges want incoming students to know. Furthermore, results of the National Curriculum Survey conducted by ACT Spring 2007 report high school teachers' view of preparation for college mathematics are not at all similar to the view held by college instructors. Colleges want students to have an in-depth knowledge of fundamental skills and knowledge but according to the survey high school seniors do not have the necessary prerequisite skills. With the current push for mandated state proficiency tests, high school curriculums tend to provide instruction on a broad range of topics of which most, unfortunately, are covered superficially.

Ignash (1997) and others offer conflicting reports about the roles postsecondary institutions should play in providing remedial education to ensure quantitative literacy for all. Questions arise to what course offerings are appropriate at the college level and whether or not these courses should be offered at four-year institutions. Most proponents will agree it is necessary to provide educational opportunities for all persons seeking post-secondary education, however disagreements abound as to who should bear the financial burden. Re-teaching of material supposedly mastered in K-12 education has policy makers demanding answers; however, the reality is students entering postsecondary education will need some form of remediation. Research also suggests rising enrollments in remedial coursework and students in general who are not prepared to succeed in credit bearing entry-level coursework will remain strong for many years to come.

Statistical data provides strong evidence students entering college are under-prepared to do college level mathematics. Past efforts to remediate this population typically in the form of dull drill and practice routines have not achieved the desired results. Should we give them more of what they experienced in high school; dull, dreary, and devoid of interest lessons in mathematics or do we attempt to understand their

misunderstandings and common errors they exhibit in various content domains in an attempt to provide high quality mathematics instruction for all students? It is felt by some that additional time spent practicing will eventually lead to mastery, however research indicates that techniques required for proficiency are not difficult to master but serious conceptual dilemmas arise as students attempt to make sense of mathematical concepts learned in isolation. Efforts to understand the underlying difficulties faced by learners have not been adequately addressed. In an attempt to understand student difficulties, a panel was assembled as part of a one-day symposium held at Cleveland State University March 2012 to discuss remediation strategies. Part of this presentation included a panel discussion where four different remediation strategies were identified, the flipped classroom, supplemental instruction, ALEKS based remediation modules, and design of a prep chemistry course. Prior to this discussion of these topics, all in attendance were asked to respond to a variety of questions pertaining to their placement process, areas other than mathematics that pose difficulties for students learning to occur, areas of mathematics that their students typically struggle with, and finally who should bear the responsibility of remediation. The results are summarized in Tables 1 through 4.

Table 1
Placement Process for General Chemistry

Question	Yes	No
Minimum ACT/Sat score in place	30%	70%
General placement exam	44%	56%
Prep chemistry course	75%	25%
College mathematics requirement	50%	50%
Other not listed	27%	73%

Table 2
Perceived Difficulties other than Mathematics by Rank

Inability to read critically	24%
Missing class regularly	18%
Poor organizational skills	24%
Distractions in the classroom	19%
Other not listed	15%

Table 3
What Areas of Mathematics are Problematic

Perceived Deficiencies	Strongly Agree	Agree	Disagree	Strongly Disagree
Percentages	13%	63%	25%	0%
Lack of number sense	10%	80%	10%	0%
Calculator Dependency	70%	30%	0%	0%
Precision of measurement (Significant figures)	50%	33%	17%	0%
Not able to solve basic literal equations	55%	45%	0%	0%
Inability to effectively work with scientific notation	37%	36%	27%	0%
Dimensional Analysis	64%	27%	9%	0%

Table 4
Who Should Bear the Responsibility of Remediation?

The Institution	37%
The Chemistry Department	36%
The Mathematics Department	0%
The Student	18%
The Local High School	9%

Next, our panel reviewed the four different strategies identified as having potential to revitalize and engage the learner. The first segment introduced the “flipped” classroom. In this setting, it was explained that the learner could come to class prepared to engage in learning activities as a results of readings or watching topic specific videos outside of the regularly scheduled class times. This way when students meet in the face-to-face classroom the focus is on activities to promote insightful learning of specific concepts. In this manner, students are able to connect applications to the theoretical.

Supplemental Instruction (SI) is another way to provide student assistance outside of regular classroom session. Meeting with a graduate student in a smaller more intimate environment as opposed to the large lecture group. Those who elect to participate communicate their misunderstandings to the SI leader who acts as a liaison between students and professor providing valuable feedback to professor in terms of what concepts students are understanding or not understanding. Specifically the SI can pinpoint

difficulties student are experiencing as the semester progresses. For example, one of the biggest pitfalls is the student’s inability to cancel out units when converting values, and in a broader sense, the student’s overall lack of “number sense” with respect to basic algebra including scientific notation. SI sessions also allows for the option of re-winding concepts, meaning if a student is stuck on something that was lectured on 2 weeks ago, the SI can revisit that topic and show how it relates to the current topic.

Another remediation possibility is the use of on-line leaning modules. Using a product such as ALEKS, students work on areas of weaknesses. Instructors have the freedom to create as many modules as they feel are necessary to remediate perceived deficiencies. After deficiencies have been identified to the student, he or she begins by taking an initial assessment for the designated module. From here, ALEKS identifies what the student can do and what topics they are ready to learn next. As this is a self-paced environment students are required to read the explanations

provided by the software package. This forces the students to make sense of the material they are reading rather than sitting passively in a classroom. This places more of the responsibility of learning on the student. Successful completion of each module is determined by the instructor. For example, a unit on use of percents the instructor might require 100% proficiency whereas a unit basic algebra and use of literal equations proficiency might be set at 80%. While ALEKS is not the only on-line product available it is one of the few packages that does not feature the use of multiple-choice responses.

Lastly, the idea of using a prep chemistry course as a prerequisite for general chemistry was discussed. Unlike preparatory chemistry taught elsewhere, the course, introduced at Cleveland state three years ago, is divided into two sections: The first section introduces the student to the fundamental concepts of chemistry at the molecular level. In the second half of the course, the student is taught how to apply these concepts in problem solving. This part of the course involves math remediation, units of measurement, introduction to the mole concept, dimensional analysis, and stoichiometry. The concept of this course, developed by Dr. Jerry Mundell and Dr. Anne O'Connor, is to first build a foundation in concepts before introducing the rigors of application.

Some symposium participants indicated that their institution already has a preparatory chemistry course similar to Cleveland State's. One person shared that her institution developed a math course for general chemistry that addresses the weaknesses commonly encountered in general chemistry. Initially designed for nursing students it was explained that it has expanded to encompass students pursuing STEM majors.

For a list of references, please contact Ellen Mulqueen at
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Mr. Jerry Overmyer
The Flipped Class Model: Creating a 21st
Century Classroom



Jerry has teaching experience in secondary and college mathematics. He is the coordinator for MAST WebConnect, and provides expertise on quality resources for teachers and students in mathematics and science. Jerry also teaches mathematics for Elementary Education Teachers and is the judging/volunteer coordinator for the Longs Peak Science and Engineering Fair. He is the creator and facilitator for the Flipped Class Network - an online professional learning network for teachers using podcasting and the flipped teaching model.

Presentation

The Flipped Class Model: Using Video Podcasting to Revolutionize the Classroom

Jerry Overmyer, of the MAST Institute, presented "The Flipped Class Model: Using Video Podcasting to Revolutionize the Classroom". The flipped classroom model encompasses any use of using Internet technology to leverage the learning in a classroom, so instructors can spend more time interacting with students instead of lecturing. This is most commonly being done using teacher created videos that students view outside of class time. It is called the flipped class because what used to be classwork (the "lecture") is done outside of class and what used to be homework (assigned problems) is now done in class.

In 2009, Jerry created the Flipped Class Network, a professional learning network for flipping teachers. The network recently surpassed 4500 members worldwide!

A recent survey showed that roughly half of all flipped classrooms are in science and chemistry is by far the most popular. This is most likely due to the fact that chemistry requires not only conceptual understanding and a strong knowledge base, but also incorporates hands-on laboratory activities. Chemistry instructors just don't have the time to cover all the material! Chemistry teachers are finding that creating online videos of lab set up and procedures is freeing up immense amounts of classroom time for experiments. Chemistry is also a subject that requires extensive symbolic

manipulation, and teachers are finding that creating videos of these procedures creates a permanent archive of sample problems that students can rewind and view at their own pace.

The flipped learning model has grown immensely in the past year and has been featured on 60 Minutes, CNN and in USA Today and the Washington Post. As Internet technology progresses it is becoming easier and easier for instructors to create and post their own online instructional videos. For more information visit flippedclassroom.net.

In the Fall of 2012, Jerry will be doing his PhD dissertation work by studying the effects on student achievement by "flipping" sections of College Algebra.

For more information contact:

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Mr. Mohsen Manouchehri Math



Mr. Mohsen Manouchehri is the current Manager of the Developmental Math Program at Cleveland State University. He obtained his Bachelor and Master degrees at Cleveland State. Mohsen is proud to be teaching at Cleveland State since 1987.

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Ms. Elise Baron SI Leader*



Elise Baron was born and raised in Cleveland Ohio, attended Ohio University for my undergraduate degree with a major in biology and a minor in fine arts. She returned to Cleveland for her masters degree in biomedical engineering at Cleveland State. Her interests are in biomechanical engineering and the neuromuscular system.

Presentation Supplemental Instruction

Elise spoke on behalf of the relationship that the professor and the SI have, in particular, how the SI can provide feedback to professor in terms of what concepts students are understanding or not understanding. This is due to the fact the S.I works with students in a smaller more intimate environment as opposed to the large lecture group the professor may be dealing with. She can then report any teaching techniques that were successful or not-successful to the instructor. Next she elaborated on drills that have proven successful in her SI sessions, including worksheets, answer specific question that the students didn't feel comfortable asking in class. Lastly she spoke on behalf of her experiences in chemistry, and how being "relatable" can help students cope with newer /difficult concepts. In summery, her portion of the talk was based on the idea that the SI provides a "gateway" or "bridge" between the students and professor when trying to understand certain topics that maybe the professor deems as easy or elementary, and the students have no understanding or clue of what is going on.

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*Supplemental Instruction (SI) Sessions provide additional academic support to a variety of classes. SI courses incorporate an SI Leader, usually a student peer or graduate student, into the course who attends all f the course lectures. The SI Leader then conducts 2 to 4 scheduled reviews sessions each week that follow the course lectures. The sessions are peer-led review sessions provided for selected courses. The SI sessions provide a chance for students to get together with classmates to compare notes, discuss important concepts, and develop strategies for studying the subject. The sessions are facilitated by a trained SI leader. The leader attends lecture each day, taking notes and listening closely to the professor. The leader does not re-lecture or give his/her class notes, but helps the students become independent learners by planning activities that encourage students to work together and process material themselves.

Mr. Kurt Farrel: Supplemental Instruction



Kurt Farrell worked as an SI/SLA for two years while completing his master's degree in biomedical engineering at Cleveland State University. Currently, he is working on his PhD in biomedical engineering, also at Cleveland State University. As an

undergraduate at The Ohio State University, Kurt studied both chemistry and biology. He also works part time at Cuyahoga Community College as a TA, instructing the general chemistry lab courses. In his spare time Kurt enjoys listening to music, visiting art exhibits, and watching Cleveland sports.

Presentation Supplemental Instruction

For my portion of the talk I spoke of specific methods that I noticed students struggle with and how that can effect them on topics discussed further in the semester, or even further in their chemical career. For example, one of the biggest pitfalls is students ability to cancel out units when converting values, and in a broad sense, the students lack of "number sense" with respect to basic algebra including scientific notation. I then discussed the type of learning environment SI can provide. In particular, how SI allows for the option of re-winding concepts, meaning if a student is stuck on something was lectured on 2 weeks ago, the SI can revisit that topic and show how it relates to the current topic.

I concluded by explaining that a solid foundation in elementary algebra is a big stepping stone in solving more complex chemical problems, and SI allows for repetition and drills in these easier problems, so when students have test problems that do require more critical thinking, the student can "knock out" the easier mathematical operations such as conversions which can allow them greater time to focus on the more difficult critical thinking portion of test questions.

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Dr. Jerry Mundell Preparatory Chemistry: Foundation and Remediation



Jerry Mundell is the Director of the Freshman Chemistry Program at CSU. He received his BS in Chemistry from the University of Massachusetts and his Ph.D. from Case Western Reserve University. Dr. Mundell's contributions to the CSU Chemistry Department

have been recognized with the College of Science Outstanding Staff Recognition Award (2009) and the University Distinguished Staff Service Award (2010). During his thirteen years at Cleveland State University, Dr. Mundell has dedicated his time to such programs as Upward Bound and Learning Communities. He also implemented general chemistry placement examinations along with a preparatory chemistry course to help ensure students success in the study of chemistry. CSU's first General Chemistry Symposium is the result of the collaboration between Dr. Mundell and Barbara Adams of Cengage Learning.

Presentation Preparatory Chemistry: Foundation and Remediation

Today's general chemistry curriculum faces the two-fold challenge of maintaining competitive standards in the science major's course work while at the same time properly addressing the ever-increasing remedial needs of our students. Instructors must deal with the decision to either 1) build remedial tools into their major courses, that will cost time for instructors in class or for students as they play catch up or 2) use primer general chemistry textbooks geared for "today's students". With preparatory chemistry courses, remediation can be kept out of, or at least minimized, in major course work, and time may be more profitably spent moving course content along.

Caution should be exercised in choosing a prep chem. textbook. The typical introduction to chemistry text or chemistry for non majors text may not provide the proper level of math remediation. In the preparatory chemistry course,

introduction to all of the general chemistry concepts are not needed. An understanding of the concepts leading to the balanced chemical equation, will allow a substantial portion of the course to address math remediation, stoichiometric calculations, and exercises in problem solving.

By creating preparatory course material that addresses not only introductory chemistry concepts but also mathematical applications of the concepts, students will be able to gain the knowledge and confidence to succeed in general chemistry.



For more information please contact
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Survey Questions:

Please respond to one or more of the following questions.

Would you support another general chemistry symposium?

If yes, would you attend, present a paper, participate in a poster presentation, or work shop?

What topics would you be interested in for the next symposium?

It is our hope to expand the symposium into a two day forum. Such an expansion would not only provide participants with a wider array of presentations and activities, but also add a social aspect involving evening activities in Cleveland. Would you support this?

Would you support bi-yearly meetings consisting of review lectures which would enable instructors to refresh their backgrounds in physical chemistry, organic chemistry, and analytical chemistry? The lectures would be given by research chemists who would relate the subject matter to their current research. Such lectures would be open not only to university and community college instructors but also to secondary school teachers. If this is implemented, the symposium and review lectures would alternate each year.

Please submit your responses to Jerry Mundell at j.mundell@csuohio.edu