



# STEM Ed



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from THE DIRECTOR

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## Alternative Certification Conference

STEM Ed and the UMass School of Education hosted an NSF funded conference called STEM ACT in Arlington, VA on May 5-7. The focus was on what we know and what we need to know about alternative certification programs for science teachers. The goal was to frame a research agenda while providing useful advice to the academic researcher, policy maker, and provider communities.

About 70 people took part, and everyone served as either a presenter or a responder. Informal feedback on the conference was very positive. The participants appreciated the format, which included time on the last day to reflect on the presentations and discussions and to sketch out the three relatively short "white papers" which will be produced for the respective communities.

One point that came up repeatedly was that "alternative certification" is, at best, a poorly defined concept. To some, it means programs designed to respond to teacher shortages by putting career-changers and others into classrooms more quickly than "traditional" teacher education programs. Others use this designation for anything other than a four year undergraduate certification program. By this definition, since most UMass teacher education programs are post-baccalaureate, they represent alternative certification, a designation not locally accepted. The consensus was that there needs to be a continuum of teacher preparation programs to serve the varied needs of schools and pre-service and in-service teachers.

Keynote speaker Ken Zeichner, from the University of Wisconsin-Madison, opened the conference with an excellent, critical overview of the relevant educational research. He noted that much of what is believed about program excellence cannot currently be supported by the evidence. He criticized oversimplified measures of excellence in teacher preparation. One can't judge the quality of a program by a simple criterion such as its length without, for example, taking into account the characteristics of the participants. Furthermore, it is not enough to have a checklist of program elements without also inquiring in depth about the implementation and efficacy of those elements. To illustrate, mentoring of new teachers is important, but in practice the quality and extent of the mentoring varies enormously. The challenge for researchers is to determine what we need to know about a teacher education program to be able to judge its effectiveness.

As noted, the STEM ACT conference will produce three "white papers." The conference website, [www.stemtec.org/act](http://www.stemtec.org/act), will have those available when they are completed. The website also has the conference proceedings online. ■

***The consensus was... there needs to be a continuum of teacher preparation programs to serve the varied needs of schools and pre-service and in-service teachers.***

More about the conference appears inside this newsletter on page 2.

# CONFERENCE ON ALTERNATIVE CERTIFICATION FOR SCIENCE TEACHERS

BY YIJIE ZHAO

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The STEM Education Institute and the School of Education held a national conference entitled “Science, Technology, Engineering and Math Alternative Certification for Teachers” (STEM-ACT) on May 5-7 in Arlington, Virginia. This is the third conference STEM Ed has managed for the National Science Foundation (NSF) in Arlington.

Funded by a \$200,000 grant from NSF, the conference brought together about 70 researchers, policymakers and practitioners nationwide, with additional participants from Canada and Australia. The conference was organized by Allan Feldman and Joseph Berger (UMass School of Education) and Mort Sternheim (STEM Ed), with the assistance of graduate student Yijie Zhao (Education) and the advice of a national advisory committee.

***Funded by a \$200,000 grant from NSF, the conference brought together about 70 researchers, policymakers and practitioners nationwide, with additional participants from Canada and Australia.***

The keynote address was delivered by Ken Zeichner, an internationally renowned scholar in teacher education. Other featured participants included Emily Feistritzer, president of the National Center for Alternative Certification (NCAC), and Antoinette Mitchell, vice president of the National Council for Accreditation for Teacher Education (NCATE). Among the participants were also representatives from national alternative teacher certification programs, such as the New Teacher Project, Transition to Teaching and Troops to Teachers. A few recent graduates of alternative certification programs also attended and shared their perspectives.

The conference provided a forum for the participants to have a constructive discussion of the prevalent features and issues centering upon the practice, research, and policy on alternative certification of secondary science teachers. The participants took an in-depth look at the existing alternative certification programs and models, examined research needs, methods and outcomes, and suggested areas for policy recommendations. They took particular note of issues specific to science teachers, including recent research on teaching and learning, content specific pedagogic approaches, and laboratory safety.

Three “white papers”, corresponding to the three strands mentioned above, will be produced as a way to disseminate knowledge generated through the conference and to inform the ongoing efforts to improve the recruitment, preparation, and retention of high quality science teachers through alternative certification routes.

The conference web site [www.stemtec.org/act](http://www.stemtec.org/act) has the agenda, plus many of the papers and abstracts; the white papers will be there as well when they are completed. ■

## Nanotechnology Summer 2007 Institute

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Nanotechnology deals with materials on the scale of nanometers. A nanometer is one-millionth of a millimeter, or about 10 atomic diameters. Such materials can have surprising and useful behaviors and properties. Applications of this rapidly growing field include regenerative medicine, fabrics and construction materials of unprecedented strength, ultra-high performance computers and data storage, more efficient solar photovoltaic cells, and much more. Nanotechnology is an interdisciplinary subject that impacts areas of physics, chemistry, biology, and engineering. This leads to applications of this exciting new field that are appropriate for most science or technology courses.

The National Science Foundation (NSF) announced in April that it had awarded \$16 million to UMass Amherst to establish the Center for Hierarchical Manufacturing.

The new Center will host one of the nation’s elite nanotechnology centers. Combined with state matching funds, this investment will accelerate research and production of ultra-tiny devices which will in turn create new manufacturing opportunities and stimulate economic development in Massachusetts and beyond. James Watkins (Polymer Science and Engineering) and Mark Tuominen (Physics) will direct the new endeavor which involves more than 50 UMass faculty members.

The STEM Education Institute will be involved with the Center and plans to organize a summer program for science teachers in July 2007. In addition, the Center will develop several other educational programs around this new technology. Watch [www.umassk12.net/nano](http://www.umassk12.net/nano) for more information. ■

# STEM EARTH CENTRAL: Spreading the Word

As reported earlier, we held our first of three annual NASA and UMass funded STEM Earth Central Summer Institutes a year ago in August 2005. That group of 39 teachers included a stimulating mix of both new and experienced teachers, local commuters and people from as far away as Texas, and teachers of all the usual sciences plus math and technology. This summer we offered our second Institute from July 31 to August 11 and 40 teachers participated.

The program incorporated map-making with Global Positioning Systems (GPS) devices, using rocks as well as geological bedrock maps, the carbon cycle and global warming, ozone, and the water cycle. Highlights included special workshops on Geographic Information Systems (GIS) software by QianYu (Geosciences), Measuring Vegetative Health by Brian Rogan (Boston Museum of Science), Forest Watch by Barry Rock and Michael Gagnon (both from University of New Hampshire), and NASA moon rocks by Naomi Volain (Springfield Public Schools). The use of Internet resources and remote sensing data was featured throughout. (See sidebars: page 4, list of participants; staff, this page.) The third and last Institute will be offered summer 2007.



David Gorrill, a teacher from Barnstable High School in Massachusetts, has leveraged the workshop into a grant award:

*Based upon what was done during the summer, I was able to secure a grant through the Enoch Cobb Fund to purchase eight GPS units. Building off of what was taught in the class (in the most concise way I have encountered yet!), I have presented methods to science department members as an inservice, and also to others in the history and community service departments. In*

*help, especially the NASA resources and its S'cool program. At the Texas statewide Conference for the Advancement of Science Teaching in Houston, I presented some lesson plans which included websites and resources I had learned about at STEM ED. I also presented information on ozone testing and the S'cool program at a Teaching Environmental Sciences Workshop in Clear Lake, Texas.*

*my own course, the use of GPS and digital satellite imagery (primarily from Mass GIS) has allowed a forward extension on the baseline mapping already done in class.*

article continued page 4

We recently asked our staff and 2005 participants to report on their dissemination efforts over the past year. They have been quite active in spreading the word. Staff presentations include:

- Richard Yuretich offered several workshops at the Early Career Geoscience Faculty Workshop Program for young geoscience college faculty at the College of William and Mary in June 2006.
- Richard Yuretich and Stephen Schneider did a hands-on, three-hour Saturday "STEM Adventures" global warming program at UMass in April for 75 Girl Scouts and their parents.
- Robert Snyder presented a Science and Engineering Saturday Seminar for over 50 science teachers on mapping skills and GPS technology.
- Tarin Weiss gave a Saturday seminar on Schoolyard Science.

Nina Corley, who teaches in Galveston, Texas, reports:

*I shared information on three days at the Odyssey Charter School where I mentor science teachers. I shared information as well as where to find*

Another Texan, Bobette Doerrie from Perryton, TX, has been submitting papers as well as doing workshops. She writes:

*I have presented a workshop on "Stealth Earth Science-NASA Based Activities", at two sessions at the Regional Math and Science Conference at West Texas A&M University. I am confirmed for presenting at the Texas State Conference for the Advancement of Science in Wichita Falls, TX, and will repeat the "Stealth Earth Science-NASA Based Activities", since participant response was so positive. I gave a workshop on astronomy, the seasons, and phases of the moon for Girl Scouts. I have submitted an article on "Stealth Earth Science" to the STATellite, a publication of the Texas Association of Science Teachers. An adaptation of my presentation on Global Warming has been submitted for the publication Hands Across Texas, a yearly publication of the Texas Council of Elementary Science.*

## Staff

**Mort Sternheim**, STEM Ed, Principal Investigator  
**Richard Yuretich**, Geosciences, Co-Principal Investigator  
**Steve Schneider**, Astronomy  
**Rob Snyder**, Brookline H.S., retired  
**Tarin Weiss**, School of Education  
**Holly Hargraves**, Hampshire Regional H.S., retired  
**Eugenie Harvey**, Office Manager  
**Ronnie Booxbaum**, Project Manager  
**Dan Gullage**, Staff Assistant

### Visiting Presenters

**Barry Rock**, University of New Hampshire  
**Michael Gagnon**, University of New Hampshire  
**Brian Rogan**, Boston Museum of Science  
**Qian Yu**, Geosciences, University of Massachusetts  
**Naomi Volain**, Springfield Central H.S., Springfield

Participant listing page 4

# STEM EARTH CENTRAL: Spreading the Word

continued from page 3

Alan Roditi is a first year teacher in New York City, having just completed an alternative certification program. He reports:

*I will be having parts of an action research paper I wrote published by the United Federation of Teachers. I am awaiting notice as to when this will appear. It is scheduled for the Teacher Center Newspaper. The paper was on hands-on activities including visual aid usage in the classroom.*

Mark Greenman at Marblehead High School in Massachusetts has long been involved in teacher professional development. This summer he ran an earth science workshop, grades 4-9:

*We have been awarded two DOE Science Institutes to run again this summer (I took last summer off to take the Earth Central Institute at UMASS with you!). The relevant Institute is: "Hands-on Earth Science for Educators Grades 4-9." Investigations will involve classifying and identifying rocks and minerals, the study of rock formations, plate tectonics, understanding the earth-sun-moon relationship, and study of the earth's atmosphere. We will visit geological formations, analyzing topographic features and taking samples as we work on classifying and identifying rocks and minerals. We intend on "borrowing" the kickoff GPS activity from the Earth Central workshop.*

Susan Reyes of the Northeast Sustainable Energy Association writes:

*I wrote most of the October 2005 Junior Solar Sprint newsletter, Northeast News, and there you will note NASA references, global warming questions, and the Carbon Travels! activity referenced inside. I loved that activity and located the author at the New England Aquarium and got his permission to disseminate Carbon Travels! through Junior Solar Sprint workshops and/or the NESEA website [www.nesea.org/education/](http://www.nesea.org/education/) where it is meant to be found in the educational materials section.*

Brendan Hayes and Sam Genier, middle school teachers in Newton, report:

*Overall, our dissemination project was a success. After taking a collection of rocks from a geologic cross section of Massachusetts, we presented our findings to 14 colleagues at a city-wide science department meeting. Our collection consisted of 15 samples from outcrops along RT 2 extending from Concord to Williamstown. At each site rock samples were collected, GPS coordinates were recorded, the mileage noted, and a photo taken. This data and collection showed a rough geological profile of the state in which we attempted to demonstrate real rock samples in reference to the real Geologic Bedrock Map of Massachusetts introduced to us during the STEM workshop in August. In addition to the presentation of the rock samples and the bedrock map, participants in our workshop were introduced to GPS technology in an activity in which we mapped the school campus. ■*

## 2006 EARTH CENTRAL PARTICIPANTS

**Ginger Armstrong**, computer and web design, Lee Public Schools, Lee

**Thomas Aiken**, integrated earth science, physical and life, Kennedy Middle School, Florence

**Erin Beechinor**, science, Thurston Middle School, Westwood

**Tracey Gilroy Benkosky**, earth science and chemistry, North Andover H.S.

**Ronald Burney**, special education, Maurice Donahue Elementary School, Holyoke

**Mindy Chapman**, earth science, conservation ecology, Wahconah Regional H. S., Dalton

**Kathleen Chlanda**, math and science, Michael E. Smith Middle School, So.Hadley

**Bobbie Coleman**, science and math, Chestnut Accelerated Middle School, Springfield

**Joshua Copen**, earth science, Amherst Pelham Regional H. S., Amherst

**Lisa Dangutis**, science, Herberg Middle School, Pittsfield

**Jessica Farwell**, math, Four Rivers Charter School, Greenfield

**Patricia Feeley**, math, Sacred Heart of Jesus School, Gardner

**Robert Feeley**, science and technology, RFK Lancaster School, Lancaster

**William Girardi**, earth science, Frontier Regional School, South Deerfield

**Alissa Hanna**, earth science, Chicopee Comprehensive H.S., Chicopee

**Nick Harrison**, electronics and engineering, Amherst Pelham Regional H.S., Amherst

**Margaret Holzer**, earth and environmental sciences, Chatham H.S., Chatham, NJ

**Carl Katsu**, environmental and astronomy, Fairfield H.S., Fairfield, PA

**James Klaiber**, environmental and technical science, Franklin County Technical School, Turners Falls

**Cynthia Krol**, earth science, Walsh Middle School, Framingham

**Shawn Lucas**, math, Ralph C. Mahar Regional School, Orange

**Jorie MacLeod**, science and math, Sanderson Academy, Ashfield

**Heather Makes**, general science, Nessacus Regional Middle School, Dalton

**Donna Marble**, earth science, Franklin H. S., Franklin

**Mary McCarthy**, science, Saint Patrick School, Chicopee

**Michael McCarthy**, general science, E.W. Thurston Middle School, Westwood

**Stacey Militello**, science, Oak Middle School, Shrewsbury

**Abigail E. Morton**, earth science, Woburn Memorial H.S., Woburn

**Joseph Mullett**, life science and chemistry, South Middle School, Westfield

**Uma Palreddy**, integrated science, Chestnut Accelerated Middle School, Springfield

**Abraham Phelps**, physics and earth-space science, Central H.S., Springfield

**Paul Power**, earth and space science, Kennedy Middle School, Natick

**Jean Schneider**, science, Saint Thomas the Apostle School, West Springfield

**Joan Schneider**, science and math, Saint Mary Elementary School, Westfield

**Theodore Schubert**, physical and environmental science, Quabbin Regional H.S., Barre

**Sheila Slawiak**, math and science, William R. Peck Middle School, Holyoke

**Nancy Strouse**, technology and computer, Saint Thomas the Apostle, West Springfield

**Heather Wagner**, earth science and chemistry, Framingham H.S., Framingham

**Helene Wherry**, earth science, Lakeview Jr. H.S. School, Dracut

**Hongqin Zhang**, science education, University of Massachusetts, Amherst ■

This fall we will again offer STEM Adventures, three-hour Saturday hands-on experiences for Girl Scouts in grades 4-9. Each Saturday afternoon program includes two 75 minute sessions. Most of the presentations are made by undergraduate science majors, who serve as role models and craft exciting science events. This fall's offerings include:

### October 14 1:45 PM-5:00 PM

(1) Amazing Physics Experiments such as the lightning machine, dancing flames, suicide pendulum Science Outreach Club  
(2) Chemistry Fun Explore invisible inks, investigate the colorful combinations that you didn't realize were lurking in your kitchen pantry, and learn how to make some tasty crystals! Chemist Sharon Palmer and the Chemistry Club.

### November 4 1:45 PM-5:00 PM

(1) Global Warming Modeling the carbon cycle, measuring carbon dioxide in the atmosphere. Astronomer Steve Schneider and the Science Outreach Club  
(2) Shake N' Bake: Exploring Plate Tectonics Use hands-on activities to demonstrate the influence of plate movement on sea floor spreading, differences between continents and ocean basins, properties of earth materials, and the location of earthquakes. Geologist Richard Yuretich and the Science Outreach Club.

The feedback last semester was very positive.

Some comments from the Scouts were:

*-This was the most fun understanding science class ever!! -I liked the snacks and I liked learning about carbon dioxide and making colors change.  
-I also liked learning about plate tectonics and volcanoes. -Well organized!  
Very informative. Performed very well. Made time fly by. -I loved the program.*

Remarks from the adults included:

*-Very interesting! Great activities! -Good to have the female assistants present. Good role modeling! -It is very important that young girls are exposed to math/science concepts early in their academic lives. This program shows the girls that science is fun and is also for them.  
-The hands-on aspects were excellent!*



Additional information is online  
at [www.umassk12.net/adventures](http://www.umassk12.net/adventures)

## PV STEMNET LOOKS FORWARD TO FUTURE FUNDING BY KATHY BAKER

The Pioneer Valley Pre K-12 Science, Technology, Engineering and Mathematics Network (PV STEMNET) completed its second year (August 2006) under the guidance of Allan Feldman, Professor of Education at the University of Massachusetts Amherst.

The PV STEMNET network of schools, institutions of higher education, other formal and informal educational organizations, and regional industries was established in the summer 2004 with funding from the Massachusetts Board of Higher Education with its purpose "to increase the number of Massachusetts students who participate in programs that support careers in fields related to mathematics, science, technology, and engineering ...to increase the number of qualified mathematics, technology, engineering and science teachers in the Commonwealth and to improve the mathematics, technology, engineering and

science educational offerings available in public and private schools." [Chapter 141 of the Acts of 2003, Section 13, paragraph (c)] While no activities were formally funded under this grant in the 2005-2006 academic year, thanks to the efforts of the college and public school partners, the PV STEMNET network remained intact this past year and received several grants to support STEM activities in the Pioneer Valley. The network was recently notified that it will be receiving funding for the 2006-2007 academic year.

In 2005-2006, and again in 2006-2007 PV STEMNET was the recipient of a Massachusetts Math and Science Partnership (MMSP) grant for elementary and middle school teachers. In the first year of this MMSP grant, teachers from the Pioneer Valley took courses in algebra and geometry. Last summer and this fall, teachers have the opportunity to take discrete mathematics and trigonometry. Many of these teachers

have enrolled in graduate school programs offered through the UMass School of Education, and they are taking these courses for graduate credit through Continuing Education. This program was designed to provide teachers with the content needed to take and pass the state's MTEL exam.

PV STEMNET also received its second CITI grant - phase 2 of its "Teachers Implementing Imagery and Imaging in the Classroom" and an additional CITI partnership grant for a robotics program with Holyoke Community College.

PV STEMNET was very busy this September. In addition to receiving new STEM funds for programs (to be determined at a later date), the network will oversee the final year of its first MMSP grant; it will receive a new three-year MMSP grant for additional math and science programs in the region. PV STEMNET held an organizational meeting on September 13 at Holyoke Community College. ■

# SPRING SEMESTER FIELD TRIPS

## TO UMASS BY RONNIE BOOXBAUM

Aided by the NSF STEM Connections grant, we were able to schedule and carry out three field trips to the University for area middle school children. This spring the groups that visited campus were: Sue Regensburger's seventh grade classes at North Middle School in Westfield, MA; Mary Seccareccia's sixth graders from Fairview Memorial Veterans Middle School in Chicopee, MA; and Debbie Hoppe's seventh graders from Forest Park Middle School in Springfield, MA.

The goals of these trips were to expose the middle school students to the University, show them diverse fields of science, and get them excited about their future and possibilities that exist in furthering their education. Each group took part in demonstrations and ate lunch at the Franklin Dining Commons.

On March 31, Sue Regensburger's students participated in a physics demonstration, an anthropology mini-lecture about the four fields of anthropology with an emphasis on archeology and lemurs in Madagascar, and an interactive session at the University barns with alpaca, horses, pigs, cows, and baby goats. The 105 students and chaperones were actively engaged in all the lectures and demonstrations and particularly liked the buffet aspect of the Franklin Dining Commons, where they ate with University students. On returning to their classrooms, each group designed and signed a huge thank you card with personal comments.

Some of their comments follow:

*Dear UMass, Thank you for allowing us to go there for our field trip! You guys rock! That's why I'd like to go there.*

*Thank you UMass! The science demonstration was exquisite! The anthropology demonstration was intriguing! The farm was really fun, too! Also, the food was astronomical!!*

*I enjoyed the science presentation... because of that, I feel like going to UMass. Thank you for the awesome trip. I really like the physics.*

*Thank you UMass! The part of the field trip I liked the best was learning from the students.*

Mary Seccareccia, 10 chaperones, and UMass Fellow Laurin Sievert, led 128 students to UMass for their field trip on April 7th. They took part in a similar schedule. However, the anthropology lecture was given by two different



graduate students. They also emphasized archeology and added cultural anthropology with a focus on music. Upon the students' return to Fairview Memorial Veterans Middle School, each student wrote a thank you note to the UMass staff and faculty.

*Dear UMass Volunteers, I had a delightful time. The activities were great and the food was terrific. The fries are 10 times better than McDonalds. Kenneth.  
PS. Can I have your ice cream machine?*

*Dear UMass Peoples, Thank you for having me on your Campus. I enjoyed my trip there and I hope I can go there again soon. My favorite part of being there was the lunch. It was like being in a huge buffet, but 20x better. Thank you. Sincerely, Cory*

*Dear UMass, Thank you for having me at your school. I had a lot of fun there. My favorite part was the animals. I loved the pigs and the goats. They are so cute. It was very big. I felt very small. Sincerely, Chantel*

*Hello. Thank you for letting us come to UMass. We all had a great time. I think that it was educational for most of us who paid attention. I loved the whole trip and it was nice for you to let us come. Thank you again. Sincerely, Emma*

*Dear UMass, I am greatly thankful for all that you have done. I learned a lot and hope to go there some day when I choose my college. I appreciate all the presentations and food you have provided. My favorite thing was lunch. Please tell your cooks they do a great job and need to be thanked for that. Sincerely, Future Student, Michael*

*Thank You UMass, I would like to thank the students at UMass. I would like to tell them thank you for showing us all of those cool experiments. I know that they volunteered and didn't get paid and they didn't have to show us those experiments. They probably could have had other plans, but instead decided to help us kids learn more. I would also like to thank the people at the barn for showing us the animals. Finally, I would like to thank the people who made and served our lunch; it was really good and it must have taken a long time. These are all the people I am thanking for a fun trip at UMass. From Kassie*

The final trip, on May 10th, was taken by Debbie Hoppe's students. Because of bus delays, Ms. Hoppe's students along with UMass Fellow Richmond Ampiah-Bonney were involved in only one demonstration, chemistry. They also ate at the Franklin Dining Commons. Her students were equally enthusiastic about their adventures at the University.

These field trips not only impacted the young students, but also the University undergraduate (physics, veterinary sciences) and graduate (anthropology, chemistry) students who created the presentations.

STEM CONNECTIONS has now ended. This NSF GK12 program provided 10 Fellowships annually that allowed graduate students in science and engineering to work with K12 teachers and students. Principal Investigators were Julian Tyson (Chemistry), Kathleen Davis (Education), and Morton Sternheim (STEM Ed Institute).

The Fellows, who are future researchers and academics, gained an understanding of the needs of the schools. The participating Teacher Scholars had an opportunity to improve their knowledge of science and science teaching, and their students gained an increased understanding of science and had the experience of working with college role models.

The three year program was scheduled to end in May 2005, but it continued on a reduced level this past year with residual grant funds, plus some support from STEM Ed, Graduate Dean John Mullin, and Outreach Vice Provost Sharon Fross. These funds enabled the STEM Education Institute to have two graduate students spend one day per week each in urban middle school classrooms. There was also some support from PI Tyson's NSF research grant, Integrating Research and Education: Tracking Arsenic from Pressure-Treated Wood. This project aims to develop better ways of measuring arsenic in classrooms and other environments. A research assistant on this grant also spent one day per week in a classroom.

FELLOW	TEACHER SCHOLAR	MIDDLE SCHOOL
Bobbie Coleman	Uma Palreddy	Chestnut Accelerated, Springfield
Laurin Sievert	Mary Seccareccia	Fairview Memorial Veterans, Chicopee
Richmond Ampiah-Bonney	Debbie Danoff-Hoppe	Forest Park, Springfield

The graduate students worked with the teachers helping the middle school students to undertake original research studies on environmental problems. At the end of the school year over 300 children, teachers, and chaperones from these schools presented their results at a science conference held at UMass. Two of the teachers also brought their classes to campus during the semester. (See "Spring Semester Field Trips to UMass" page 6).

Bobbie Coleman, a graduate Fellow, developed a Girl Power program to encourage more underrepresented middle school girls from Springfield to consider career options in STEM related fields. Fun, relevant, hands-on activities were designed to prompt girls to enter more advanced science fair projects. The students were mentored in a wide range of activities involving alternative fuel and other environmentally related topics. Coleman thought that girls could be challenged to meet extremely high expectations without the inhibition or the fear of competition with boys. The girls met at least once a week in an after school science workshop where they explored and developed ideas using the Internet and the building materials provided by our program. They developed their ideas into research projects that included working models of solar cars, alternative transportation using opposing magnets (mono rail trains), other models of futuristic transportation, bacterial pollutants, and the increased presence of greenhouse gasses. The solar and hydrogen cars were entered into the Tour de Sol in Saratoga Springs, NY, May 10-14, 2006 and won two prizes. The Massachusetts Girls Collaborative Project provided a mini-grant that assisted the students in purchasing some of the materials for their projects.

Coleman also worked with middle school students after school, preparing them to participate in regional and national science fairs. In the spring of 2005 and again in 2006, four Chestnut Accelerated students from this program entered prize winning research projects into a national science fair sponsored by the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers. This year, the organization bestowed second and third place awards to Monique Farrell, 13, and Jasmine Green, 14. Monique created a working model of a hydrogen fuel cell car, while Jasmine's model car relied on solar energy. The young scientists and two of their classmates, Shanice Douglas and Haley Mack, both 13, competed against more than 30 other pupils in the junior division of the organization's 18th annual science fair. Shanice created a working model of a magnetic train and Haley tested salad bar vegetables for levels of E. coli. Monique said the experience of speaking with the judges improved her communication skills. She said she likes cars and chose to create one that would help in an energy crisis. Jasmine said creating her car was fairly easy once she learned about solar panels and solar cells. She said going to California and being judged by professionals motivated her to do well on her project. "I think it's good that they have such programs (like the science fair) for the black community," Jasmine said. Haley said it was the chance of a lifetime. "I didn't get to win, but the whole experience was worth it for me," she said. ■

### SPRING SEMESTER FIELD TRIPS TO UMASS from page 6

Mr. Heath Hatch of the physics department leads a very active undergraduate student group that routinely presents physics demonstrations to diverse visiting groups on campus. Their presentation included a bed of nails, shrinking and expanding balloons, a Van de Graaff generator and more. Coleman Krawczyk responded to his part in the middle school presentation:

*I felt that these two groups of kids were among the best*

*that I have presented to. Both groups seemed to be interested in what we showed them and had good questions about what they saw. I truly enjoy doing these presentations for the local young people. I only hope that by doing this I will inspire some of these young people into studying science when they get older.*

That is a hope we all share, thanks to the efforts of UMass staff and students. ■

# SCIENCE AND ENGINEERING SATURDAY SEMINARS

## Spring 2006 Summary and Fall 2006 Offerings BY RONNIE BOOXBAUM

On 10 Saturdays during the fall and the spring semesters of the 2005-2006 academic year, a total of 110 middle and high school Massachusetts science teachers gathered on one or more Saturdays to learn about a myriad of science topics to enliven their curriculums. Teachers had the option of earning Professional Development Points at no cost or obtaining graduate credits with additional requirements at a reduced cost. Since this program is no longer grant-funded, it has become necessary to include a small fee for the participants this fall.

Overall, the teachers were quite pleased with the information they learned. The workshops offered during the 2005 fall semester can be found on our website:  
[www.umassk12.net/sess](http://www.umassk12.net/sess)

The workshops given in the spring semester were: solar electric cars presented by Susan Reyes from the Northeast Sustainable Energy Association, Universal Design for Learning conducted by Mary Moriarty, ADA coordinator at Springfield Technical Community College, transportation engineering offered by Mike Knodler from the UMass Civil and Environmental Engineering Department, schoolyard science demonstrated by Tarin Weiss from the UMass School of Education and Global Positioning Systems (GPS) led by Rob Snyder of our STEM Education Institute.

Some of the comments from the teachers who participated in the spring workshops were:



*These are great. They expand my knowledge of science and technology while giving me excellent materials to use in my classroom. This is a very valuable experience.*

*These have been a wealth of information. The program is terrific. I have used many of the ideas in the classroom.*

*I have been attending these seminars since their inception and have always come away with fresh ideas for my curriculum.*

*The topics were very enjoyable and extremely informative. I thank you for opening my eyes to new concepts to be used in the classroom. The lesson plans and activities given to us are extremely helpful.*

*Saturday programs have provided a solid dose of information on a range of topics in their fields. The handouts and links are super. Networking is an added value of the Saturday program.*

*Even when material was not related to subjects which I teach, it could be shared with my co-workers.*

### **FALL SCHEDULE OF PROGRAMS.** [www.umassk12.net/sess](http://www.umassk12.net/sess) for further information.

#### **September 16**

**A Walk through the Jurassic.** Richard Yuretich (UMass Geosciences) The Connecticut Valley was the REAL Jurassic Park some 200 million years ago. Bipedal dinosaurs roamed a landscape of tropical flora, large lakes and rivers, and belching volcanoes. We'll look at several places around Mount Tom that enable us to reconstruct the conditions that existed during this time and we'll look at the subsequent events that created the area we see today. A good pair of walking shoes and dressing for the weather is a must.

#### **September 30**

**Structural Engineering: Bridges and Skyscrapers.** Sergio Breña (UMass Civil Engineering) Basic concepts in structural engineering (forces, stresses, material properties). An overview of famous bridges and skyscrapers, focusing on how the development of structural forms and new materials have contributed to design changes. Common structural systems used in bridges and skyscrapers; how different structural forms contribute to overall strength and stiffness of bridges and buildings.

#### **October 14**

**Astronomy and Nature Optics for the Classroom.** Steve Schneider (UMass Astronomy) and Ron Woodland. Participants will experiment with two of the main tools of the astronomer: the telescope and the spectroscope. We will employ affordable basic classroom telescope and spectroscope kits in various activities. Binoculars and telescopes appropriate for individual and school use will be demonstrated. Concepts such as magnification, field of view, light gathering ability, ease of use, and more will be discussed. Bring your telescope and binoculars so we can discuss how to operate them properly. Weather permitting, we will be able to make observations of the sun and moon with specialized telescopes.

#### **October 28**

**Evolution in the Classroom: Should We Change Our Approach in Light of the Intelligent Design Controversy?** Bruce Byers (UMass Biology). It is important that teachers be able to give students and parents a cogent, informed response to queries about Intelligent Design, so we will begin the workshop with an overview of ID and the scientific critique of it. Then we will develop appropriate strategies and methods for incorporating evolutionary biology in the science classroom.

#### **November 4**

**Nanotechnology II.** Mark Tuominen (UMass Physics). Last fall we had a seminar on nanotechnology which dealt with materials and devices created on the nanometer size scale. This seminar will explore other applications in this exciting new field. ■



## FAREWELL TO STEMTEC

STEMTEC, the Science, Technology, Engineering, and Mathematics Teacher Education Collaborative, has come to a successful conclusion after nine years. It was one of about two dozen National Science Foundation funded Collaboratives for Excellence in Teacher Preparation. Designed to produce additional, better prepared, and more diverse K-12 science and math teachers, the initial collaborative included the University of Massachusetts and its Five College partners (Amherst, Hampshire, Mount Holyoke, and Smith Colleges), plus the three area community colleges (Greenfield, Holyoke, and Springfield Technical). STEMTEC subsequently expanded to include over 20 Massachusetts colleges and universities that prepare teachers. The original grant ran from 1997 to 2002. A smaller add-on grant provided funds for summative evaluation and new teacher support for three extra years plus an additional year with a no-cost extension.

Unlike future elementary teachers, science majors often wait until late in their college careers to decide to teach. This provided the rationale for the two main STEMTEC components, the *course improvement* and *student programs*. Course improvement refers to efforts to restructure introductory STEM courses. Moving away from straight lecture to more student

active modes is intended to make the courses more engaging, provide better models for the unidentified future teachers in the classes, and reduce the heavy attrition from STEM majors. K-12 school faculty served as the pedagogy experts, reversing the usual school-college workshop roles where the college faculty members are the content experts. Approximately 200 college faculty participated in these programs.

The *student program* had several threads. We offered new certification pathways that are now in place, and awarded scholarships to many potential teachers. We also featured teaching experiences which improved the students' own understanding of the material and the learning process, exposed them to the possibility of teaching as a career, and represented a service to the community because of their engagement in the public school system.

The follow-on program, STEMTEC II, consisted of summative evaluation and new teacher support, which included new teacher dinner or lunch meetings, the Science and Engineering Saturday Seminars (see page 8), new UMass M.Ed. options including an online seminar course for new teachers, and the Tuesday STEM Ed Seminars. All but the new teacher dinner/lunch meetings will continue for the foreseeable future.

## STEMTEC FACULTY DEVELOPMENT PROGRAMS

BY KERRY ANN O'MEARA, SCHOOL OF EDUCATION

The STEMTEC program's goals were (a) increase and improve active learning in STEM courses (b) provide quality professional development for faculty, thus increasing the number of STEM faculty who were using active-learning methods in their courses and could provide ongoing peer support for each other and (c) improve the pipeline for math and science teachers.

The final STEMTEC evaluation report of programs outlined the elements of each model, and provided a programmatic analysis by comparing the program models to best practices and research. Interviews and document analysis of final portfolios were conducted to answer the three evaluation questions and to complement the data that was collected in previous evaluations. First, this evaluation sought to understand the impact different faculty development programs had on faculty and their courses, including but not limited to their (a) use of active-learning (b) philosophy of teaching (c) awareness of their own pedagogy and its impact (d) commitment to and satisfaction with teaching (e) sense of support for teaching and (f) course revision/design. Second, the analysis explored how STEMTEC programs influenced (a) how students learned in class (b) types of student learning and (c) the future plans of students. Third, the evaluation explored which programs were most cost-effective and outcome intensive and which program models were most

appropriate for meeting program goals.

In reviewing the models, we saw a continuum in terms of intensity, with the learning community model (Faculty Fellows) being the most intense and having the greatest impact on individual faculty teaching careers. Thus the Faculty Fellows and the Cycle III Winter Workshops cycle provided greater relationship building and time to apply learning to practice at the most reasonable cost. The Pathways Conferences and statewide institutes provided superior opportunities for networking and peer support for participants as well as a tool-box for participants to take home. Dinnertime roundtables provided a convenient opportunity to attend sessions on areas of interest and network with colleagues. Finally, the writing retreat supported the scholarly side of faculty careers by creating an encouraging setting for faculty to disseminate their teaching innovations in peer-reviewed venues.

STEMTEC findings are:

- Faculty learning communities can

have a significant impact on faculty teaching careers including but not limited to changing faculty philosophy of teaching, helping faculty understand how students learn, providing a tool-box of active-learning teaching methods, increasing awareness of how one's own pedagogy impacts students and sense of support for and commitment to teaching.

- Faculty development influences how students learn, the skills they acquire, and their future career plans.

- Stipends are important symbolically and as an incentive to recruit participants, but they do not need to be large and should be tied to some direct outcome, such as a report of changes in teaching pedagogy and/or assessment of student outcomes.

- While faculty development programs are often focused on changing one course, they inevitably change the teacher, who uses the learning to improve all of their classes.

- The earlier that the professional development program happens in faculty members' careers the better, as they will be able to use the learning throughout the remainder of their careers. ■

# NUTRITION AND HEALTH IN THE SCIENCE CLASSROOM: ONLINE EDUCATION FOR SCIENCE TEACHERS

BY NANCY COHEN  
AND PATSY BEFFA-NEGRINI

This spring, UMass Online Nutrition Education: UMassONE (<http://www.umassone.net/>) will begin its 11th year of working with UMassK12 in helping teachers integrate inquiry-based nutrition education into their science classrooms.

The most recent offering, Nutrition and Health in the Science Classroom (<http://www.umass.edu/seo/nutrition.htm>), addresses National Science Education Standards and Massachusetts Life Science Curriculum Frameworks including skills of inquiry, functions of human body systems, organization of multicellular organisms, development, and personal health.

Nutrition is an important topic for middle and high school students. Obesity and eating disorders are major health issues at this age and students experience growth spurts and changes in body structure. During the course, teachers increase their understanding of the science of human nutrition, gain skills in teaching inquiry-based learning activities or case studies, and improve their confidence in using computer technologies. A graduate of the course commented, *I liked that the instructor used an inquiry-based approach to the class, giving us some firsthand experience with this method of teaching.*

Course activities include projects or case studies, lessons teachers complete in their own classrooms, opportunities to explore the World Wide Web, and ideas for using the computer as a professional resource. *Materials were very up-to-date and relevant to current issues in society,* said one participant.

More than 25 Massachusetts teachers have completed Nutrition and Health in the Science Classroom. They enjoyed the interaction and sharing of teaching ideas that occurred through the course's online discussion system. They also had high praise for the way the course was organized and the efforts of the instructor, Dr. Patsy Beffa-Negrini.

Another teacher wrote, *This course was, in my opinion, well-designed and well-delivered. The instructor's availability, responsiveness, level of organization, and sense of humor were all very much appreciated. The case study approach was interesting and the other portions of the course fostered a good deal of interaction.*

Now that the U.S. Congress is requiring all schools with federally funded meals programs to implement wellness policies that address nutrition and physical activity, Dr. Beffa-Negrini feels that *professional development in health for teachers which helps them integrate nutrition into their science teaching is timely and important. All kids eat, so food can be the hook that helps engage students not only to eat better but to have fun learning science, too.*

Nutrition and Health in the Science Classroom will be offered in the Spring semester of 2007. For more information about registering for this convenient and interactive course, go to: [http://www.umassone.net/courses/credit/nutri\\_in\\_science.htm](http://www.umassone.net/courses/credit/nutri_in_science.htm). Further information on this and other online food safety and nutrition courses are on the UMassONE Web site: <http://www.umassonline.net> ■

## 2006-2007 NOYCE SCHOLARS ANNOUNCED

BY RONNIE BOOXBAUM

Named in honor of the "Mayor of Silicon Valley", Robert Noyce (1927-1990), the Noyce Scholarship is funded by the National Science Foundation. The STEM Education Institute and the STEP (Secondary Teacher Education Program) Program in the School of Education at the University of Massachusetts Amherst joined efforts to recruit science, math, and engineering students who would make dedicated middle and high school science and math teachers. Seven University graduate students were chosen and awarded Noyce Scholarships this past Spring. Each student will receive a \$10,000 scholarship to further his/her education at the University of Massachusetts. In return, each student must agree to teach in a high needs school district in Massachusetts or elsewhere for two years for every one year of scholarship money that he/she receives. The student scholars are:

**Mr. Manuel Chambers** Mr. Chambers, who plans on teaching math, is currently working in the field of education as a math paraprofessional at the Holyoke Alternative Program which serves Latino and other youth who have challenges with succeeding in a regular classroom. Mr. Chambers noted that it was his students' positive reaction to his teaching that gave him the impetus to become a math teacher, as well as the desire to be a positive role model for Latino students.

**Ms. Melissa Kelly** Ms. Kelly is majoring in biology and plans to teach at the high school level when she finishes her education. Her interests include an exchange student experience at the University of Western Australia and an Atlantic 10 Commissioner's Honor Roll designation for 2003 and 2005 in rowing. This award recognizes a student's dedication to both academic work and athletics.

**Ms. Renee MacKay** Ms. MacKay, a geology major, is receiving her second scholarship. On her application she remarked: *The Noyce Scholarship has been a blessing to me in so many ways. Foremost, this scholarship program has provided me with the financial resources to finish my bachelor's degree in geology. On a more personal note, I believe being a part of this program was the incentive I needed to initiate my involvement in two volunteering opportunities this year. These two programs were CHILL - a snowboarding program for at-risk youth and the STEM Education Institute's Global Warming Workshop for Girl Scouts.*

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# SCIENCE EXHIBITION AND DEMONSTRATION

## ON JUNE 1, 2006

BY RONNIE BOOXBAUM

On June 1, 2006, 273 students from Fairview Memorial Veterans Middle School, Chicopee, and Chestnut Accelerated and Forest Park Middle Schools, Springfield, MA, their teachers, UMass science graduate student fellows and the STEM Education Institute staff participated in a morning of science presentations and demonstrations.

The first part of the morning was devoted to an exhibition of student posters describing their science experiments. Each school was allotted 30 minutes to display the student posters while the other two schools' students viewed the posters and asked questions of the young scientists. This schedule rotated to allow all students to be both presenters and viewers.

The subject matter for the science experiments was varied. There were many experiments on the testing of arsenic in water and wood. A sample of experiments performed by the students and illustrated on their posters was: Does a school door handle, bathroom sink handle, or desk harbor the greatest amount of germs? (sink handle); Where should batteries be stored to prolong their lives? (freezer); What growth requirements are best for plants? (sunlight is a necessary variable); Which color fabric absorbs the least amount of heat from the sun? (blue, not white); Does a layer of paint on pressure treated wood prevent leaching from arsenic to the environment? (slows it); Does a 2006

Dodge Durango emit fewer CO<sub>2</sub> emissions than a 2001 Dodge Durango? (2006 emits more CO<sub>2</sub>!).

The second part of the morning had the young scientists as audience members in two of three UMass science demonstrations. The demonstrations were Physics is Phun carried out by Mr. Heath Hatch and his undergraduate science club students, Geology of Ice Worlds given by Dr. Stephen Schneider, and Chemistry is Cool by Dr. Dhandapani Venkataraman and his graduate students. Highlights for the students included enthusiastically watching items disappear from sight in physics (the power of oil) and witnessing a miniature volcano erupt in geology.

**Highlights...included enthusiastically watching items disappear from sight in physics (the power of oil) and witnessing a miniature volcano erupt in geology.**

The students filled out surveys at the end of their visit concerning the morning's events and their classroom science programs from the past school year. Most concluded that the day was a success as was learning about science during the 2005-2006 school year. The survey asked them to complete the following sentences (in italics), along with their responses:

*-One thing I like about science is ... 'how fun and cool it can be!' 'doing experiments.' 'you can help people.' 'you can get more involved.' 'finding out how the world works.' 'I like how science is present in everything and how almost everything can be explained with it.'*

*-One thing I liked about today was ... 'looking at the posters.' 'the different eclipses and things I didn't even know.' 'going around seeing the college experience.' 'you made it fun and had us learn.' 'everyone was excited about science.'*

*-One thing I learned about science this year (included two very practical responses)... 'a lot of vocabulary words.' 'don't eat chemicals.' The students also learned, 'it is all around us.' 'some chemicals combined can make useful things.' 'always try hard on an experiment.' 'the earth has a lot of things we need to fix.' 'arsenic and how it affects the environment and people.'*

The morning ended with lunch at "The Hatch" in the UMass Student Union. The exuberant students were welcomed by Michael Gargano, Vice Chancellor of Students Affairs and Campus Life. For their work with STEM Education Institute, recognition awards were given to teachers Ms. Mary Seccareccia, Ms. Uma Palreddy, and Ms. Debbie Hoppe and to UMass Fellows Ms. Laurin Sievert, Ms. Bobbie Coleman, and Mr. Richmond Ampiah-Bonney. ■

## 2006-2007 NOYCE SCHOLARS

concluded from page 10

**Ms. Marianne Metzger** Ms. Metzger, a biology major, has studied both physical and life sciences in addition to a minor in psychology. This past Spring '06, she participated in TEAM, Together Everyone Achieves More. This UMass education course prepares participants to tutor middle and high school students and requires that they actually tutor youngsters for a total of 50 hours during the semester.

**Mr. Matthew Snow** Mr. Snow has deferred his schooling and scholarship for one year since he will begin his teaching career this fall at Cathedral High School in Springfield, MA. He will be teaching math. Matthew related that as far back as 8th grade, he was tutoring friends and was told that he would make an excellent math teacher.

**Ms. Anne Talley** Ms. Talley's undergraduate major was natural resource studies with minors in plant and soil sciences and forestry. In her application she noted, *It is because of the great teachers that truly inspired me as a young student that I have chosen to also become a teacher that strives to do the same.*

**Ms. Vanessa Turner** Ms. Turner majored in biology. In her application she commented, *I have always wanted to teach. I can remember playing "teacher" as a young girl. I would line up my stuffed animals, make an attendance sheet, and the back of my door would serve as the chalkboard.* Today she states, *"I want there to be a certain energy in my classroom that will make my students want to come, be prepared, and learn about the beautiful science we call biology."* ■

# STEM Ed

## Newsletter of the STEM Ed Institute



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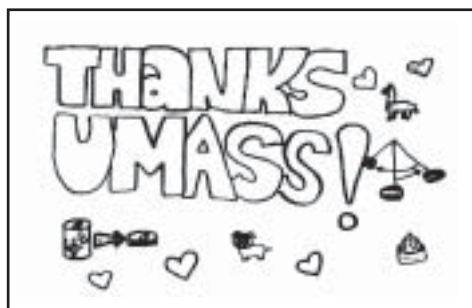
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Thank you card from North Middle School students in Westfield

## CALENDAR

### STEM Ed TUESDAY SEMINARS

4:15 PM in Hasbrouck Laboratory 138, usually the first and third Tuesday of the month. Refreshments at 4:00 PM. No charge; parking is in the Campus Center Garage. For more information, check [www.umassk12.net/calendar](http://www.umassk12.net/calendar).

- September 19 Engineering the Future: Designing the World of the 21st Century. Julie Brenninkmeyer, Boston Museum of Science
- October 3 Fostering Inquiry and Critical Thinking through Technology. Merle Bruno, Hampshire and Beverly Woolf, UMass
- October 17 Teaching Talent Can be Measured by a Test - True or False: Are Teacher Certifications Tests a Gateway or a Barrier? Rob Snyder, STEM Education Staff
- November 7 Evolution in the Classroom: How Should We Respond to the Intelligent Design Challenge? Bruce Byers, UMass Biology
- November 21 Teaching Issues and Experiments in Ecology, (TIEE): A Peer Reviewed Electronic Journal Designed to Help Ecology Faculty Teach Better. Charlene D'Avanzo, Hampshire
- December 5 Improving Post Secondary Teacher Preparation in Afghanistan. Joe Berger, UMass School of Education

### SCIENCE AND ENGINEERING SATURDAY SEMINARS

For K12 teachers, Saturdays 8:30 AM to 1:00 PM. See [www.umassk12.net/sess](http://www.umassk12.net/sess)

- September 16 A Walk through the Jurassic Richard Yuretich, UMass Geosciences
- September 30 Structural Engineering: Bridges and Skyscrapers Sergio Brena, UMass Civil Engineering
- October 14 Astronomy and Nature Optics for the Classroom Steve Schneider, UMass Astronomy and Ron Woodland
- October 28 Evolution in the Classroom: Should We Change Our Approach in Light of the Intelligent Design Controversy? Bruce Byers, UMass Biology
- November 4 Nanotechnology II Mark Tuominen, UMass Physics
- November 18 Makeup date for weather cancellations
- December 9 Recall for those registered for graduate credit

### STEM ADVENTURES SCIENCE SATURDAYS

For Girl Scouts, 1:45 PM to 5:00 PM

- October 14 Amazing Physics and Chemistry Fun
- November 4 Global Warming and Shake N' Bake: Exploring Plate Tectonics

### COMING THIS SUMMER, 2007 Tentative dates to save

- July 23 - 27 Nanotechnology Institute
  - August 6 - 17 STEM Earth Central Institute
- Check [www.umassk12k.net](http://www.umassk12k.net) for further information.