CREST
Center for Restructuring Education in Science and Technology

# Science Education

GEORGE MASON UNIVERSITY

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**College of Education and Human Development**
**George Mason University**

## SOL Scores Increase for Students of Provisionally Licensed Science Teachers

In a recently released research report from CREST, *New Science Teachers' Support Network: What School Leaders Can Do To Support New Science Teachers,* findings reveal that students of teachers who received support from the New Science Teachers' Support Network score significantly better than students of control teachers on Virginia science SOL tests. Funded by the National Science Foundation, the project examines how to best help beginning teachers succeed at teaching. Findings were shared in Spring 2008 at the annual meeting of the American Educational Research Association in New York City and at the annual meeting of the National Association for Research in Science Teaching in Baltimore. The report shares findings from the project that school leaders concerned with how to support new science teachers will want to read. In addition to increases in student test scores, the report shares how the expertise of retired science teachers can be effectively used to support new science teachers, as well as the ways in which schools can either support or hinder the success of new science teachers. NSTSN is a collaborative research project involving George Mason University, Fairfax County Public Schools, Prince William County Public Schools, and Arlington Public Schools. Dr. Donna R. Sterling is the principal investigator, and Dr. Wendy Frazier is the program manager. To read the recently released report, see http://cehd.gmu.edu/crest/researchprograms/nstsn/

## New Elementary School Science Grant Award Alexandria City Public Schools

CREST continues its funded work with elementary teachers at Jefferson Houston School for Arts and Academics (JHAA) and Cora Kelly School for Math, Science, and Technology in Alexandria City Public Schools (ACPS). Directed by Donna Sterling (PI), Wendy Frazier (Co-PI) and Leslie Marcus (lead science teacher at JHAA), participating teachers attend Saturday training sessions for collaborative planning and action research. Amy Bordeaux, a former doctoral student in science education leadership, serves as the evaluator on the project and is conducting case study research on the experiences of science laboratory teachers in these two elementary schools. With the guidance of Melissa Hamilton (ACPS Science Curriculum Specialist), CREST is planning a two-week training this summer for teachers on energy from physical and Earth science perspectives. Many thanks to Leslie Marcus for opening her classroom and her schedule to work with CREST faculty!

## SUNRISE New STEM Education Partnership

SUNRISE (Schools, University 'N' (and) Resources In the Sciences and Engineering) is a new NSF GK-12 project aimed at partnering STEM (science, technology, engineering, and mathematics) graduate students with school teachers from three school divisions (Fairfax County, Manassas Park City, Alexandria City Public School). The need for SUNRISE project arises from the critical need to develop permanent University-School division partnerships to address the challenging issues in K-12 education and to contribute toward the national effort for improving our educational enterprise. After the first year in the program the science and engineering graduate students have enhanced several science lessons from the current Virginia State Science Standards of Learning (SOL) and have also implemented exciting lessons from their graduate research. For samples of these lessons, visit http://sunrise.ite.gmu.edu.

## Stars and Splash Summer Camp 2008

Astronomy and oceanography are the focus of the two CREST science camps in summer 2008 for students entering grades 5-7. Students will have fun as they act as scientists to solve real world problems. Camp will be taught by preservice master's degree

teachers in Mason's PK-6 teacher licensure program under the direction of Dr. Wendy Frazier. Donna Sterling serves as resident scientist. Session one (June 23-July 3) focuses on space science and session two (July 7-18) will focus on oceanography. Space is limited to 24 children per session on a first-come, first-served basis. A special addition to this camp is its integration of Mason's science content faculty during curriculum planning and implementation with Dr. Harold Geller (astronomy) and Dr. Randy McBride (oceanography). This summer fieldtrips will include visits to Mason's pond and observatory as well as Gunston Hall Plantation, Great Falls Park, and Udvar Hazy Air and Space Museum. Information at http://cehd.gmu.edu/crest/camp/

## High School Teachers Serve as Technology Specialists in Science Methods Course

In their advanced science methods course (EDCI 673) preservice secondary science teachers learn how to use educational technology by partnering with an inservice teacher in their science content area. Over the course of a month, they learn about various content-specific technologies used in science classrooms. Many thanks to the following inservice teachers from Fairfax County Public Schools for serving as technology specialists in EDCI 673 for Spring 2008: Janet Soules (Earth science) Mount Vernon HS Center, Tony Rugari (physics) Edison HS, and Debbie Meinholdt (biology) Edison HS.

## Doctoral Students Teach Mason Science Education Courses

Mollianne George Logerwell and Dawn Renee Wilcox are teaching our advanced science methods at the secondary (EDCI 673) and elementary (EDCI 634) levels respectively this spring. Teachers enrolled in both classes design and conduct action research to determine how to best meet the science learning needs of students. As an institution dedicated to preparing our doctoral students to be leaders in the science teacher education field, CREST recognizes the importance of providing these adjunct opportunities to doctoral students. Please contact Donna R. Sterling (dsterlin@gmu.edu) if you are at the doctoral or post-doctoral level and wish to co-teach and/or serve as an adjunct professor in science education.

## Awards

- Lisa Leno received the 2008 Science Education Leadership Program Award for Science Education master's degree students.

## Student Test Scores Increase for Modeling Physics Instruction

Student test scores increased for the teachers who participated in Modeling Physics Instruction.
The Modeling Physics Instruction project:

- Significantly increased student achievement in science, and
- Significantly increased teachers' subject matter knowledge in physical science and physics concepts aligned with Virginia's *Standards of Learning*.

A comparison of pre- and post-test results for students revealed that the project significantly increased student achievement as measured by student performance on the Force Concept Inventory (pre: 22.4%, N=456; post: 42.3%, N=451). In addition, Force Concept Inventory and Mechanics Baseline Test results reveal that teacher participants experienced a significant increase in their content knowledge from pre- to post-test.

For the last three years, Melissa Booker and Greg Matthes, teachers from Fairfax County Public Schools, have been leading modeling physics courses for middle and high school physical science and physics teachers. Modeling Instruction is a constructivist-based physics and physical science curriculum and pedagogical method. The physical model is articulated and validated through post-lab discussion using Socratic dialogue and through multiple representations: graphical, mathematical, verbal, and diagrammatical. Funds have been provided by the federal Improving Teacher Quality State Grants (Title II, Part A,) Professional Development Program administered by the State Council of Higher Education for Virginia. For more information:
http://cehd.gmu.edu/assets/docs/crest/newsletters/physics.pdf

## Elementary Science Education

Please share with instructional assistants, parents, and others interested in obtaining licensure to become an elementary school teacher that "Think You Want to Be a Teacher" information sessions on our elementary programs offered in Fairfax and Loudoun will be held this summer on May 27 and July 21. Registration for either of these information sessions is available by clicking the link on http://cehd.gmu.edu/admissions/infosessions/
The deadline for admission to programs is Feb 1 each year, and the website for admissions information can be found at http://gse.gmu.edu/programs/elementaryed/admissions/ or contact Carol Ardon (sardon@gmu.edu).

## Student Funding

- Faye Huie received a 10-hour graduate research assistantship to assist with data analysis for CREST science camp and the NSTSN.
- Brad Rankin received a 10-hour graduate research assistantship to assist Erin Peters with her research on self-regulation strategies to teach the nature of science.
- Mollianne Logerwell received a 20-hour graduate research assistantship to assist with CREST activities and to conduct research on NSTSN.

## CREST Research Assistant

*By Faye Huie*

I have been working at CREST for approximately ten months. Since then, I have graduated from the masters program and am now finishing up my first semester as a doctoral student. My experience here at CREST has equipped me well for the Ph.D. program. As a research assistant, I can apply what I have learned about research methods in my program and provide insights as to how to approach large data sets and the complications that may emerge. Throughout my ten months here, I have assisted in developing a paper that examines how different types of preservice teacher education may impact teacher self-efficacy and content knowledge. The faculty here pays special attention to the students' interests and assigns projects that would provide the most opportunity for student growth. I have enjoyed my time here at CREST very much and plan to continue working with the faculty in the future.

## CREST Research Projects

The Center for Restructuring Education in Science and Technology (CREST) at Mason has been busy designing studies, gathering data, and working on analyses of teaching and learning. Current studies are investigating how pre-service teachers prepare for the awesome task of teaching science, how provisionally licensed teachers are best supported in the first few years in the classroom, how elementary teachers can increase student learning, and how physics teachers implement modeling physics instruction in their classroom. Upcoming studies include investigations into teacher effectiveness, creativity, and ways of knowing in science.

## Student and Faculty Presentations and Publications

- Amos Simms-Smith & Donna R. Sterling (2008, March) Wade in the Water: School, Parent, and Community Collaboration. *Science Scope 31*(7), 73-75.
- Wendy M. Frazier, Donna R. Sterling & Mollianne G. Logerwell (2008, March). *What makes or breaks new teachers? Examining the process of supporting new, uncertified physics teachers through case study analysis.* American Educational Research Association, New York City, NY.
- Wendy M. Frazier & Donna R. Sterling (2008, February). Motor mania: Revving up for technological design. *The Technology Teacher 67*(5), 5-12.
- Alexi Samsonovich, Kenneth De Jong, Anastasia Kitsantas, Erin E. Peters, & Nada Dabbagh (2008). Cognitive constructor: An intelligent tutoring system based on a biologically inspired cognitive architecture (BICA). In Goertzel, B. and Wang, P. (Eds.). *Advances in Artificial General Intelligence: Concepts, Architectures and Algorithms. Proceedings of the AGI Workshop 2008. Frontiers in Artificial Intelligence and Applications*, 13 pp. IOS Press: Amsterdam, The Netherlands.
- Erin E. Peters (2008). Building student mental constructs in particle theory. In E. Brunsell (Ed.), *Readings in science methods, K-8*. Washington: NSTA Press.
- Donna R. Sterling (2008, January). Assessing student presentations from three perspectives. *Science Scope 31*(5), 34-37.
- Erin E. Peters (2008, January). Assessing scientific inquiry. *Science Scope, 31* (5), 27-33.
- Erin E. Peters (2008, January). Validating assessment: Teacher study groups. *Science Scope, 31* (5), 48-50.
- Mollianne G. Logerwell & Donna R. Sterling (2007, December) Fun with ionic compounds. *The Science Teacher 74*(9), 27-33.
- Donna R. Sterling (2007, December). Modeling problem-based instruction. *Science and Children 45*(4), 50-53.
- Donna R. Sterling (2007, November). *Discussion of the proposed certification for the position of Science Specialist.* Virginia Association of Science Teachers, Williamsburg, VA.
- Wendy M. Frazier & Donna R. Sterling (2007, November). *Science Explorers: Investigating with Poetry.* Virginia Association of Science Teachers, Williamsburg, VA.
- Melissa Booker, Greg Matthes, & Donna R. Sterling (2007, November). *Modeling Physical Science: Strengthening Foundations in Physics.*

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Virginia Association of Science Teachers, Williamsburg, VA.

- Donna R. Sterling (2007, November). *Discussion with Paula Klonowski, Virginia Science Education Coordinator.* Virginia Association of Science Teachers, Williamsburg, VA.
- Donna R. Sterling (2007, November). *Exploring Science Specialists.* Virginia Science Education Leadership Association, Williamsburg, VA.
- Wendy M. Frazier (2007, November). How tough can it really be? *Journal of Virginia Science Education 2*(1), 78-80.

## PhD and Advanced Masters Degrees in Science Education for Experienced Teachers

Ever thought about going back to school to get an advanced masters or doctorate in science education, but you were not quite sure what you could potentially do with the degree? Mason offers two advanced masters degrees and a doctoral degree in science education. Graduates are prepared for careers as school or central office leaders, curriculum and instructional materials developers, state or national agency leaders, college or university faculty, college or university researchers, or professional organizations leaders. **If interested in these programs in science education for experienced teachers, contact Donna Sterling at dsterlin@gmu.edu for more information. Admission to the masters programs is open each semester and the doctoral program every couple of years.** For more information about our science education degrees, please see the list of programs at the end of this newsletter.

## Program Information on the Web Initial Teacher License

Mason's College of Education and Human Development offers a variety of degree programs involving science education. Here are links to the initial teacher licensure programs:

- **Initial License** with Masters in Elementary Education
  http://gse.gmu.edu/programs/elementaryed/

- **Initial License** or Masters in Secondary Education
  http://gse.gmu.edu/programs/secondaryed/

## Program Information on the Web Experienced Teachers

Mason's College of Education and Human Development offers a variety of degree programs for experienced teachers to receive advance degrees in science education. Here are links to the advanced degree programs:

- **Masters** in Science Education Leadership (includes coursework toward administration and supervision license)
  http://gse.gmu.edu/programs/science/

- **Masters** in Advanced Studies in Teaching and Learning Science
  http://gse.gmu.edu/programs/astl/

- **Doctorate** in Science Education Leadership
  http://gse.gmu.edu/programs/science/

## Center for Restructuring Education in Science and Technology

The *Center for Restructuring Education in Science and Technology* (CREST) at George Mason University, focuses on providing quality science, mathematics, and technology education from early childhood through adulthood.

Director: Donna R. Sterling
Associate Director: Wendy M. Frazier
Assistant Director: Erin E. Peters

For information check online at:
http://cehd.gmu.edu/crest/

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