

A TIME for PHYSICS FIRST

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ACADEMY FOR TEACHERS - INQUIRY AND MODELING EXPERIENCES FOR PHYSICS FIRST

LEADERSHIP IN FRESHMAN PHYSICS, 2009-14

NEWSLETTER: Vol 3, No. 3, August 2009

MATH-SCIENCE PARTNERSHIP GRANT FUNDED BY THE NATIONAL SCIENCE FOUNDATION



Our grant entitled "A TIME for Freshman Physics in Missouri" has been approved for funding by the National Science Foundation for five years (2009-14). The grant is funded by NSF's MSP Institute Partnerships - Teacher Institutes for the 21st Century program.

A TIME for PHYSICS FIRST is a partnership among the University of Missouri-Columbia (MU, lead institution), seven core partner school districts and several supporting partners. The project will be recruiting 80 Missouri ninth-grade science teachers through Fall 2009.

The partnership aims to build leadership skills with research-based professional development that includes comprehensive physics content, pedagogy, research and evaluation. Participating 9th grade science teachers will become intellectual leaders as they learn to teach a yearlong freshman physics course. The impact of this sustainable institutional change will ultimately show an increase in students' future science coursework. The goals of the program are to:

- Create a cadre of teacher-leaders who will become advocates for

excellence in physics content and research-based pedagogy.

- Strengthen high school freshman science teachers' and students' understanding of physics.
- Enhance teachers' knowledge and ability to utilize reform-based pedagogies in teaching freshman physics.
- Promote institutional change among core partner institutions.
- Increase students' interest in science coursework in higher grades.

The Summer Academy series, key to the professional development program, is an intensive residential experience that builds in content-level each year over three years. Held at the University of Missouri in Columbia, the academies focus on physics content integrated with pedagogy and leadership training. They are team-taught by university faculty and experienced peer teachers. Academies will be four weeks long in years 1 and 2, and two weeks in year 3. Participants earn graduate credit plus receive a stipend, room, board, travel support and a kit of materials.

Additionally, selected teachers of mathematics from the same schools will participate in a concurrent weeklong summer academy, and school administrators attend a three-day academy, in order to provide additional support for teachers and students as they engage in freshman physics.

To help participating teachers implement this challenging course in the 9th grade classroom, extensive academic year support includes professional learning communities for small-group teamwork, follow-up sessions, support from trained coaches or mentors, online peer collaboration, online access to content experts and a materials-kit lending program.

The project website www.physicsfirstmo.org will feature detailed information, application forms and updates in the next few weeks. Stay tuned.

We thank the partner districts and the many supporters of this grant for their help in making the proposal successful. We now count on your continued support to make the project successful!

A TIME for Freshman Physics in Missouri

Math-Science Institute Partnerships Program, National Science Foundation
grant number NSF DUE 0928924

LEAD CORE PARTNER:

University of Missouri, Columbia

CORE DISTRICT PARTNERS:

Columbia Public Schools
North Kansas City School District
Center School District
Hazelwood School District
Kirkwood School District
Chillicothe School District
Hickman Mills School District
e-MINTS – Missouri Virtual Instructional Program.

SUPPORTING PARTNERS:

Lincoln University
William Woods University
MU Partnership for Educational Renewal
MU Saturday Science Lecture Series
MU Cosmic Conversations Lecture Series
Missouri Virtual School
Central Missouri Astronomical Association
Columbia Water and Light
Science Teachers of Missouri
Heart of Missouri Regional Professional Development Center.

PROJECT SUMMARY ON MSP.NET

The proposal, entitled Academy for Teachers using Inquiry and Modeling Experiences for Freshman Physics in Missouri (A TIME for Freshman Physics in Missouri) is a Partnership among the University of Missouri-Columbia (MU), as the lead institution, seven core Partner school districts and several supporting partners. This Partnership creates 80 Teacher Leaders from participating Missouri school districts, who deliver a yearlong freshman physics course. Through ten weeks in summer academies over three years and academic year follow-up experiences Teacher Leaders deepen their physics content knowledge and develop individualized leadership skills to assist other teachers of freshman physics in providing all freshman students with an inquiry and modeling based physics experience. Both university faculty and the Teacher Leaders develop an expanded range of pedagogical and leadership skills that they share with others, as they serve as resources and catalysts for reform in science education at the secondary and post-secondary institutional levels.

In addition to the science teachers involved in the summer physics academies, selected teachers of mathematics from the same schools participate in a concurrent weeklong academy, and school administrators attend a three-day academy, in order to provide additional support for teachers and students as they engage in freshman physics.

A curriculum team, including some of the Teacher Leaders, adapts the professional development curriculum used for teachers for use with ninth grade students using the educative curriculum materials (ECM)

model. Special education teachers are involved in the curriculum repurposing, as well as becoming some of the Teacher Leaders, to infuse principles of Universal Design for Learning (UDL) to ensure the curriculum meets the needs of diverse learners. A series of formative assessment tasks to enable teachers to identify student misconceptions are identified, developed and embedded within the freshman physics curriculum.

A substantive academic year component including coaches or mentors and an online component assists teachers. Additional teacher supports include the formation of professional learning communities for small-group teamwork, electronic resources such as pod-casts of reading pages and videos of lab setups, online mentoring, kits and equipment access, as well as video access to MU lecture series in physics and in astronomy, which addresses cutting-edge research and is geared to non-experts.

In addition to generating evidence of the impact of this endeavor, the project implements a research design to answer two important questions: 1) In a teacher intellectual leadership project, can enhancement of pedagogical practice, student content acquisition and teacher leadership growth through participation in an online learning community achieve results comparable to sustained classroom coaching support? And 2) Does implementation of Freshman Physics through the project curriculum yield more positive results in student achievement in mathematics and science as compared to more traditional educational sequencing of science?

The project will be seeking additional core school district partners. Recruitment information will be available on the project website in Fall 2009.

MEET OUR PROJECT PERSONNEL

MEERA CHANDRASEKHAR, PRINCIPAL INVESTIGATOR

Meera Chandrasekhar is Curators' Teaching Professor of Physics and Astronomy at the University of Missouri, Columbia. Following her undergraduate education in India, she received a Ph. D. in Physics from Brown University, Providence, RI, in 1976. After a post-doctoral fellowship at Max-Planck-Institut in Stuttgart, W. Germany, she came to MU in 1978.



Prof. Chandrasekhar's research interests are in the area of optical spectroscopy of semiconductors, superconductors, and conjugated polymers, with an emphasis on high pressure studies. She is deeply interested in the education of young students. She has developed hands-on physics programs for K-12 students and professional development programs for K-12 teachers.

Her awards include the Missouri Science Educator Award, STOM, 2008; Presidential Award for Outstanding Teaching, 2006; Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring, 1999; and a William T. Kemper Fellowship for Excellence in Teaching in 1997.

Prof. Chandrasekhar has served as Principal or co-Principal Investigator on several educational grants funded by the National Science Foundation, Missouri Department of Higher Education, and Missouri Department of Elementary and Secondary Education. The last grant (2005-2008) supported development and implementation of professional development for a yearlong course for physics in ninth grade.

SARA S. TORRES, CO-PRINCIPAL INVESTIGATOR

Sara Torres is the K-12 science and Secondary health curriculum coordinator for Columbia Public Schools. She obtained a B.S. degree from The Ohio State University and M.A. and Ed. S. degrees from New Mexico State University. Mrs. Torres taught middle level science in New



Mexico and started the first science magnet school in the state of New Mexico in 1999. She moved to Missouri in 2002 and began working with Columbia Public Schools as a middle school science teacher.

Mrs. Torres' research interests are in the area of qualitative and quantitative observations of middle school students in the areas of cur-

riculum development, implementation, and evaluation; student performance; and locus of control.

She has received several teaching awards, including the Lorraine Schulte Excellence in Teaching Award, 2002; Las Cruces Public School District Teacher of the Year, Second Runner-Up, 2001; New Mexico Outstanding Elementary Science Teacher, 1999.

Mrs. Torres served as the Project Director of the Missouri Department of Elementary and Secondary Education A TIME for PHYSICS FIRST grant (2005-2008) which supported development and implementation of professional development for a yearlong course for physics in ninth grade.

DORINA KOSZTIN, CO-PRINCIPAL INVESTIGATOR

Dorina Kosztin is Associate Teaching Professor of Physics and Astronomy at the University of Missouri, Columbia. She obtained her B.Sc. from University of Cluj, Romania, and her M.Sc. and Ph. D. from the University of Illinois at Urbana Champaign. She came to MU in 2001.



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Prof. Kosztin has a strong interest in improving the way introductory physics courses for undergraduate students are taught and in the education of younger students. She has introduced several new teaching techniques for lower-level undergraduate Physics courses, including clickers and web-based support. For her activities she received the Provost Junior Faculty Teaching Award in 2005 and the William T. Kemper Fellowship for Excellence in Teaching in 2008.

Prof. Kosztin played a key role in curriculum development and teaching in the A TIME for Physics First project funded by Mo-DESE (2005-08).

DORINA MITREA, CO-PRINCIPAL INVESTIGATOR

Dorina Mitrea is Professor of Mathematics at the University of Missouri, Columbia. She earned her Ph.D. in Mathematics from the University of Minnesota in 1996, after which she joined the faculty at MU.

Her research interests are in the areas of Harmonic Analysis and Partial Differential Equations. Her substantial involvement in outreach activities includes work with both students and teachers. At the middle school level, she has experience coaching for the Mathcounts competition at the regional, state and national stage, as well as organizing mathematics summer camps for 5-8 graders in Columbia.

Prof. Mitrea was honored by the President of the United States at the White House as coach of top-placing students in the 2003 national Mathcounts Competition. She has won the 2001 Provost's Outstanding Junior Faculty Teaching Award



and a 2005 William T. Kemper Fellowship for Teaching Excellence at the University of Missouri.

Prof. Mitrea has coached high school students for math competitions and has organized the AMC and the Great Plains Mathematics League competitions. She has developed courses and recruitment models for attracting and preparing middle grade math teachers. She has developed curricular materials for teacher training and implemented them in a sequence of three summer institutes for Missouri teachers.

DEBORAH HANUSCIN, CO-PRINCIPAL INVESTIGATOR

Deborah Hanuscin, Assistant Professor of Learning, Teaching and Curriculum, is currently the Bess Schooling Professor of Elementary Education, jointly appointed in the Department of Learning, Teaching, & Curriculum and Department of Physics & Astronomy at the University of Missouri, Columbia. She obtained her Ph.D. in Curriculum & Instruction with an emphasis in Physics Education from Indiana University in 2004.

Prof. Hanuscin's research interests focus on teacher learning, with particular regard to scientific liter-

acy and the ways teachers portray science in the classroom. She has received numerous awards, both as a classroom teacher and university faculty member. Most recently she received the Provost's Outstanding Junior Faculty Teaching Award and



was named Outstanding Undergraduate Faculty Instructor in the MU College of Education.

Prior to coming to MU, Prof. Hanuscin was a classroom teacher and informal science educator. She has been involved in teacher professional development since 1996, and currently directs the MU QUEST Program for K-6 teachers, a content-focused professional development institute that includes an outreach program for elementary-age students.

JAMES SPAIN, SENIOR PERSONNEL

James Spain is Professor of Dairy Nutrition and Vice-Provost for Undergraduate Studies at the University of Missouri. He received a B.S. from North Carolina State University and M.S. and Ph.D. degrees from Virginia Tech. He has been at MU since 1990.

Prof. Spain's research interests focus on interactions between nutrients and the environment on lactation and reproduction of dairy cattle. He has a keen inter-

est in teaching and advising MU students. He has been involved in several MU-wide activities such as Summer Welcome, Learning Community Teams and undergraduate research projects. He has served as faculty advisor for several Clubs, including the Block and Bridle Club, CAFNR Student Council, QEBH and the Kappa Delta Sorority.



Prof. Spain has received several awards for teaching and advising, including the Green Chalk Award in 1996, William T. Kemper Fellowship for Teaching Excellence in 2001 and Governor's Award for Excellence in Teaching in 2002.

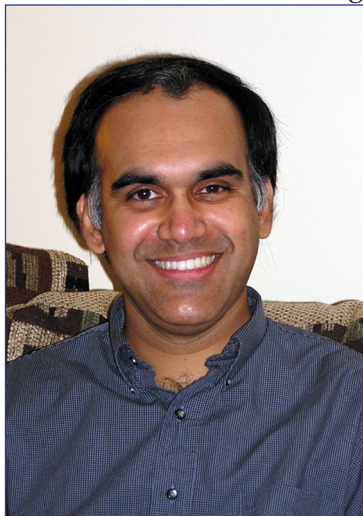
SUNDER BALASUBRAMANIAN, SENIOR PERSONNEL

Sunder Balasubramanian is Assistant Professor of Physics at Lincoln University, Jefferson City. He obtained a B.Sc. in Physics from Madurai Kamaraj University, Madurai, India, in 1991 and an M.E. in Computer Science from the Indian Institute of Science, Bangalore, India, in 1995. He then obtained a Ph.D. from Purdue University in Physics in 2003. After two years of post-doctoral work at the University of Missouri, Columbia, he joined Lincoln University as an assistant professor of physics.

Prof. Balasubramanian's re-

search is in sensor development and in biomedical imaging. He is the Director of the Adaptive Optics and the Nanophotonics Laboratory at Lincoln University and is currently focusing on developing novel laser-acoustic detection platforms to defeat Improvised Explosive Devices (IEDs) and on hormone detection in small ruminants.

Prof. Balasubramanian has always been interested in teaching and adopting novel teaching methodologies in the classroom. He is currently leading Lincoln University's efforts in transforming all



introductory physics courses into an inquiry/activity based learning environment. He is also interested in mentoring high-school students in research projects to expose them to frontier areas of science and technology. He has a student from Jefferson City currently building a coherent-domain imaging system to look at cells.

DENNIS NICKELSON, SENIOR PERSONNEL

Dennis Nickelson is an Assistant Professor of Mathematics and Physics at William Woods University in Fulton. He obtained his B.S.E. in chemistry and physics from Central Missouri State University

(University of Central Missouri), a M.Ed. from Lincoln University, and an Ed.S. and Ph.D. from the University of Missouri, Columbia.

A retired physics teacher and science chair from Jefferson City High School, Dr. Nickelson has 30 years experience teaching in Missouri public schools. He spent five summers on the faculty of the Missouri Scholars Academy. He served as the Central Missouri Science Olympiad Director for eleven years. He has been an adjunct professor for Lincoln University, Linn Technical State College, Columbia College, and University of Missouri, Columbia. He is also the chemistry and physics teacher for the Missouri Distance Learning High School after authoring the courses.

Dr. Nickelson serves as a physics teaching resource agent for the American Association of Physics



Teachers. He is chairman of the high school Department of Elementary and Secondary Education/Math-Engineering-Technology-Science committee.

His awards include Jefferson City Public Schools Teacher of the Year (finalist, Missouri Teacher of the Year), Monsanto Science Teach-

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ing Award, Sigma Xi (Central Missouri Chapter) Science Teaching Award, and Missouri Academy of Science Teaching Award.

Dr. Nickelson has served as senior staff on several professional development projects such as the lead physical science teacher for the K-6 Missouri Science and Math project, a project pioneering the use of computers in the science classroom for Columbia Public Schools, the Missouri Constructing Physics Understanding in a Computer Enhanced Environment, and Making Science Accessible Through Inquiry and Literacy for the St. Louis Public Schools (Co-PI). He served as a coach mentor and a peer teacher in the A TIME for Physics First Project funded by Mo-DESE (2005-08).

PAUL MICELI, SENIOR PERSONNEL

Paul Miceli is a Professor in the Department of Physics and Astronomy at the University of Missouri-Columbia. Prof. Miceli received his B.S. in Engineering Physics, M.S. and Ph.D. in Physics at the University of Illinois at Champaign-Urbana (UIUC). His Ph.D. research was in the area of experimental Condensed Matter Physics in which he studied the critical behavior of hydrogen in modulated metals. Subsequently, he joined Bell Communications Research (Belcore) as a Member of Technical Staff from 1987 to 1992, where he applied neutron scattering methods to study the recently discovered high temperature superconductors. In the fall of 1992 he joined the MU faculty where he pursues a research program in the area of surface physics.

Prof. Miceli's current research projects focus on understanding the atomic-scale mechanisms that



lead to the growth of films and nanocrystals. His experimental program, which is funded by the National Science Foundation, is carried out with synchrotron x-ray scattering using research facilities that he developed at the Advanced Photon Source (APS) at Argonne National Laboratory. Prof. Miceli is the Associate Director of a multi-university group that constructed and operates a beam line at the APS.

In 2006 Prof. Miceli was the recipient of the William T. Kemper Fellowship for Teaching Excellence.

ANGELA SPECK, SENIOR PERSONNEL

Angela Speck is an Associate Professor of Astrophysics at Mizzou. She obtained her B.Sc (Hons) in astrophysics from Queen Mary, University of London, followed by a Ph.D. in astronomy from University College London (UCL) in 1998. After postdoctoral appointments at UCL and University of Illinois Champaign-Urbana, she came to Mizzou in 2002. She is directly responsible for the expansion of the MU Astronomy program (which includes a minor) and is now the Director of Astronomy at MU.

Prof. Speck's research includes

studying stardust using infrared observing techniques and developing technologies and pedagogies for teaching astronomy. She was the recipient of the 2008 Provost's Outstanding Junior Faculty Research and Creative Activity Award. She has also received an NSF CAREER



Award, and has developed a large program aimed at providing research opportunities for undergraduates interested in astronomy.

Prof. Speck is also the organizer of a public outreach program "Cosmic Conversations", and coordinates tours of the Laws Observatory for school and pre-school groups. In addition Prof. Speck is currently the Chair of the National Optical Astronomy Observatory Users Committee.

SARAH HILL, PROJECT DIRECTOR

Sarah Hill earned a bachelor's degree in journalism from the University of Missouri in 1981. She is the Project Director for the A TIME for Physics First program, an extension of her position as Program Coordinator for the previous Ed-MSP program of the same name. She is a member of the project management team and reports directly to PI Prof. Meera Chandrasekhar.

Ms Hill will be responsible for management of day-to-day activities, communication with partners and participants, coordination of

academy-related administrative work; coordination of applications and admissions details; execution of the day-to-day needs of the summer academy, and coordination of the kit lending library.

Prior professional experience includes a six-year stint as coordinator of a statewide professional development and kit-lending program for K-6 science teachers, the Show-Me Science Center, which was affiliated with the Science



Teachers of Missouri and operated out of the science department of Columbia Public Schools.

MARTHA A. HENRY AND KEITH S. MURRAY, EVALUATORS

Martha A. Henry, Ed.D., CEP, and Keith Murray, CEP, of M.A. Henry Consulting, LLC are the lead evaluators for the project. They and their firm have considerable experience in the evaluation of math and science partnerships and similar teacher professional development projects, as well as evaluation and research in other areas of education and in public health, the arts, and non-profit management.

Dr. Henry's doctorate is from the University of Missouri, St. Louis. Her work in evaluation is informed by her own prior career in K-12 and university-level education as a teacher, curriculum developer, researcher and program manager.

Mr. Murray's research background began in public health and medical fields. He has as served as project director for psychiatric research grants and large-scale data collection systems, and led statistics units in state agencies.

Other members of the evaluation team serve as quantitative and qualitative analysts and support field work and project coordination.



FAST FACTS:

Grant start date: September 1, 2009

Grant period: 5 years

Funding Agency: National Science Foundation

First summer academy: Summer 2010

Applications available: early Fall 2009

Target Participants: Ninth grade science teachers in Missouri school districts

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Further information: Please refer to the project website, www.physicsfirstmo.org

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Support: This project is supported by the National Science Foundation grant # NSF DUE 0928924. NSF is not responsible for the opinions expressed in this publication.





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