



a collaboration of Iowa's public universities in affiliation with STEM education organizations across Iowa

IMSEP Funded Competitive Grant Projects FY2010

SUMMARY OF PROPOSALS:

Twenty-Eight proposals **received**.

- 14 – University of Northern Iowa Principal Investigators
- 10 – Iowa State University Principal Investigators
- 4 – University of Iowa Principal Investigators
- 8 – science, 6 – mathematics, 14 – interdisciplinary (STEM)

Fourteen proposals **approved for funding** by the IMSEP Executive Board

- 10 – University of Northern Iowa Principal Investigators [50% of submitted]
- 6 – Iowa State University Principal Investigators [50% of submitted]
- 3 – University of Iowa Principal Investigators [50% of submitted]
- 6 – science, 6 – mathematics, 7 – interdisciplinary (STEM)
- 4 Regents University collaborations

Other collaborations with: AEAs 1, 10, and 267, Logan Middle School, ISU Extension, Northwest Iowa School Districts & Industries, Iowa Geologic and Water Survey, Iowa Limestone Producers Association, Waterloo Community School District, Technology Association of Iowa, Iowa Chapter of INfraGard, IT industries and Iowa businesses, Iowa State's Midwest Transportation Consortium, Kirkwood Community College, Western Iowa Technology Community College, scores of Iowa K-12 mathematics and science teachers and pre-service teachers

- Total competitive grant funding for FY2010: \$836,582
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SUMMARY OF FUNDED GRANT PROPOSALS:

Science Education Proposals:

- **O'My Iowa Geology-Loving Outdoor Learning (OMIG-LOL)**

Description:

Research suggests people attain and retain qualitative, quantitative and critical-thinking skills through inquiry and hands-on research opportunities (Apedoe, 2006; Berkman, 2006; McConnell et al., 2005). The Universities of Northern Iowa and Iowa will use proven field courses and collaborate with the Iowa Geologic and Water Survey (IGWS) and the Iowa Limestone Producers Association (ILPA) to provide Iowa's teachers with unique and sustainable opportunities. Authentic geologic and environmental field experiences in Iowa and Colorado for Iowa's in-service and pre-service teachers will facilitate

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personal connections to the natural world, instill a passion for lifelong scientific inquiry, develop a self-sustaining geologic information network, and inspire teachers to share their experiences with each other and their students. This collaboration is projected to provide Iowa's teachers with unique and sustainable opportunities. The collaboration is projected to directly affect at least forty of Iowa's in-service teachers and fifty pre-service teachers per year. In-service teachers will earn 6-credit hours of graduate credit that may be applied towards a teaching endorsement in the Earth Sciences. This project will also develop an interactive website facilitating the distribution of scientific field experiences, authentic research data that all teachers can access, and develop a platform for anyone (students, teachers, professors, industry leaders, and state agencies) interested in the geology of Iowa and to share their knowledge.

Amount Requested: \$21,745 FY2010

Principal Investigator: John Dunkhase, Clinical Associate Professor
Departments of Science Education and Teaching & Learning
University of Iowa College of Education

Collaborators: Iowa Geologic and Water Survey
At least 40 in-service and 50 pre-service teachers
Iowa Limestone Producers Association
Linked Proposal with Chad Heinzl, UNI

- **O'My Iowa Geology – Loving-Outdoor-Learning (OMIG-LOL)**

Description: This collaborative effort between the Universities of Northern Iowa, Iowa, and the Iowa Limestone Producers Association seeks to address the growing need for well-educated geoscientists and geoscience teachers. This venture will provide field-based opportunities for Iowa's pre-service and in-service teachers that develop observational skills and fosters the production of new earth science field experiences. The project will culminate with the construction of a sustainable Iowa-geologic-education-information-network. This network will provide Iowa specific data, inquiry-based curriculum tools, virtual fieldtrips, and connections with industry professionals for Iowa's teachers/students.

Amount Requested: \$24,768 FY2010

Principal Investigators: Chad Heinzl, Assistant Professor
James Walters, Professor and Department Head
Department of Earth Science

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University of Northern Iowa

Collaborators: At least 40 in-service and 50 pre-service teachers
Iowa Limestone Producers Association
Linked Proposal with John Dunkhase, UI

- **Improving Chemistry Teaching in Iowa**

Description: Funding to survey the use of chemistry laboratory experiments in the State of Iowa to ascertain the needs of Iowa's high school chemistry teachers with respect to doing lab activities and to conduct workshops to train chemistry teachers to effectively implement student-oriented guided inquiry teaching strategies.

Amount Requested: \$180,358 FY2010

Principal Investigator: William S. Harwood, Professor and Department Head
Department of Chemistry and Biochemistry
University of Northern Iowa

Collaborators: The Three Regents Universities – State of Iowa

- **Telescopes and Astronomy Curriculum Development**

Description: Groups of 20-24 K-12 Iowa teachers will be provided with equipment and assistance in helping to develop astronomy curriculum for their teaching level through a series of summer workshops. Teachers will be provided with not only on-hand resources, but also web-based resources, including free software that can be utilized in their classrooms. The curriculum developed by participants will be freely available to all teachers via a website. The most important resource will be a computer controlled telescope that the workshop participants will use and incorporate into their lesson plans.

Amount Requested: \$33,666 FY2010

Principal Investigator: Siobahn Morgan, Associate Dean & Professor
College of Natural Sciences
University of Northern Iowa

Collaborators: 20 to 24 K-12 Iowa teachers

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- **Project-Based Learning & Other Innovative Instructional Activities for Middle School and High School Science**

Description: This proposal is for the development of a collection of project-based learning activities for teaching middle school and high school science as specified in the Iowa Core Curriculum, including 21st century skills. Thirty Iowa science teachers will meet for a two week summer writing workshop, and then pilot the projects in their classrooms in the fall. They will also videotape the activities being taught in their classrooms. Project teachers will meet throughout the academic year to discuss and refine the activities. The completed activities along with the videotapes of these activities, complete with commentary voice-overs, will be posted on a website for use for the IA DOE, AEAs and Iowa science teachers. This will allow Iowa teachers to view the lessons being carried out in real student-centered classrooms which will aid in changing the teaching that is occurring in Iowa science classroom.

Amount Requested: \$82,189 FY2010

Principal Investigator: Jody Stone, Professor
Department of Chemistry & Biochemistry
University of Northern Iowa

Collaborators: 30 Iowa science teachers

- **Improving Science Instruction in Pre-K Classrooms**

Description: Creation of a collaboration among early childhood education and science education faculty to improve science education for young children in Iowa.

Amount Requested: \$90,108 FY2010

Principal Investigator: Betty Zan, Director
Regents' Center for Early Developmental Education
University of Northern Iowa

Collaborators: University of Northern Iowa
Iowa State University
Headstart
Pre-Schools
Childcare Programs

Mathematics Education Proposals:

- **Increasing the Cognitive Demand of Mathematical Instructional Tasks in Middle Schools and High Schools**

Description: The greatest gains in student learning of mathematics transpire in classrooms in which instructional tasks consistently occur at high cognitive levels (Stein, et.al.). With many demands placed on mathematics teachers and the learning environment, implementation of high level cognitive tasks frequently materializes at lower cognitive levels. The goals of this project are to gather practicing high school and middle school mathematics teachers for a three-day workshop in June 2009 with additional 3 one-day sessions in July to assess the cognitive demand of some of the instructional tasks they incorporate in their teaching and discuss methods to change the instructional tasks in order to increase the cognitive demand of students' mathematical experiences.

Amount Requested: \$ 41,022 FY2010

Principal Investigator: Heather A. (Thompson) Bolles
Director – Master of School Mathematics Program
Iowa State University

Collaborators: Participating high school and middle school mathematics teachers
Linked Proposal with Bridgette Stevens, UNI

- **Assessment, Reflection, Community, and Knowledge (ARCK)**

Description: ARCK provides a professional development program for high school mathematics teachers emphasizing Assessment, Reflection, Community, and Knowledge. An adapted Japanese Lesson Study design, using self-study methodologies and practices based on research for developing professional learning communities is employed. Through modified Lesson Study activities and the purposeful creation of a Professional Learning Community amongst the teachers, a continuing professional development program will be developed that can be sustained once the project is completed. The content focus is the Iowa Core Curriculum for high school mathematics with special emphasis on formative assessment and integrating technology into mathematics instruction.

Amount Requested: \$ 80,852 FY2010

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Principal Investigator: Elizabeth Hughes, Assistant Professor
Department of Mathematics
University of Northern Iowa

Collaborators: AEA 1 and AEA 267

- **Establishing a Professional Development School in Middle School Mathematics**

Description: A Professional Development School (PDS) is a preK-12 school working in close collaboration with university faculty to provide extended, high quality field experiences for pre-service teachers. This project is to improve middle school level field experiences for UNI pre-service mathematics teachers by establishing a PDS for mathematics in Logan Middle School, a diverse, urban middle school located in Waterloo, IA. To do so, this project will: 1) design and implementing a school-based field experience model in mathematics education, 2) provide additional one-on-one instruction and classroom support for low-achieving middle school math students, and 3) provide instructional support for middle school mathematics teachers in mentoring, math content and pedagogy.

Amount Requested: \$ 51,896 FY2010

Principal Investigator: Jihwa Noh, Assistant Professor
Department of Mathematics
University of Northern Iowa

Collaborators: Logan Middle School
AEA 267

- **Improving Mathematics Instruction in Pre-K Classrooms**

Description: Review, develop, implement and evaluate mathematics curricular materials for Pre-K classrooms to share with Pre-K teachers for enhanced mathematics instruction.

Amount Requested: \$93,584 FY2010

Principal Investigator: Carla Peterson, Associate Dean
Department of Human Sciences Administration
Iowa State University

Collaborators: ISU Lab School
University of Northern Iowa

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Iowa Department of Education
Iowa Head Start Collaboration Office
Child Care Resource and Referral Agencies
IHEs

- **EMPOWERR**

Description: EMPOWERR is a three-year (2008-2011) MSP grant funded for \$447,831 through Title II A funds administered by the Board of Regents, State of Iowa. It delivers over 100 hours per year of mathematics content and Lesson Study training to the entire mathematics-teaching staffs at three GWAEA elementary schools (about 60 teachers). IMSEP funding allows the project to grow in scope and to include more teachers than are currently budgeted for through the MSP funds.

Amount Requested: \$52,513 FY2010

Principal Investigator: Walter Seaman, Associate Professor of Mathematics and Associate Professor of Teaching & Learning
University of Iowa

Collaborators: Grant Wood Area Education Agency

- **Increasing and Maintaining Mathematical Cognitive Demand: Implementing High-Quality Critical Thinking Instructional Tasks in Middle Grades and High School Mathematics (IM2CD)**

Description: The purpose of the IM2CD Project is to improve the academic outcomes of middle grades and high school mathematics students through addressing the nature of teachers' instructional practices that have been shown by research to influence student learning. Three broad goals that align with IMSEP Goals and Objectives drive the project: (1) prepare more high-quality mathematics teachers in Iowa's schools by addressing the need for making sound instructional decisions in grades 5-12; (2) increase access for all students to high-quality mathematics instruction that challenges them to think and reason, thus improving the performance of Iowa mathematics students; and (3) promote statewide collaboration and coordination among mathematicians and mathematics educators from Iowa's Regent universities. The project will comprise of 44 Iowa middle grades and high school mathematics teachers. Teachers' instructional practices will be examined through the lens of implementing and maintaining high-level critical thinking mathematics tasks that challenge students to think and reason.

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Amount Requested: \$ 38,867 FY2010

Principal Investigator: Bridgette Stevens, Assistant Professor
Department of Mathematics
University of Northern Iowa

Collaborators: 44 Iowa middle and high school mathematics teachers
Linked Proposal with Heather Bolles, ISU

STEM Education Proposals:

- **Mapping the Needs of Iowa's Math and Science Teachers**

Description: “Mapping the Needs of Iowa’s Math and Science Teachers” is a multi-faceted needs assessment of licensure/certification, recruitment/retention, endorsement, and professional development of math and science teachers throughout the state. Activities include creating GIS maps of teacher, student, and school/community characteristics: surveying math, science, and elementary teachers; surveying math and science consultants/coordinators; and conducting focus groups with selected math and science teachers. Results will be shared publicly with Iowa educational leaders and stakeholders and will be available on-line.

Amount Requested: \$35,605 FY2010

Principal Investigator: Mandi Anderson, Research and Evaluation Scientist
Research Institute for Studies in Education (RISE)
Iowa State University

Collaborators: Participants of the statewide teacher survey including all secondary science teachers, all secondary mathematics teachers and a random sample of elementary teachers.
Participants of the statewide consultant/coordinator survey including all science and mathematics consultants in Area Education Agencies, science and mathematics coordinators in larger school districts, and other science and mathematics outreach professional such as ISU Extension state and area specialists.
Participants in a series of ten focus groups.
Mathematics and science content experts.

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- **Iowa Mathematics and Science Academy (IMSA)**

Description: Generate in 40 low-income, first-generation and minority students yearly the skills and motivation necessary to complete a program of secondary education and matriculate to a postsecondary institution with degrees in mathematics, science and technology-related fields.

Amount Requested: \$200,507 FY2010

Principal Investigator: Angela Francis, Director
Iowa Mathematics and Science Academy
University of Northern Iowa

Collaborators: Five County Region/Schools in Eastern Iowa
Iowa State University
University of Iowa
University of Northern Iowa

- **Learning Mathematics and Science Through the Arts**

Description: Learning Mathematics and Science Through the Arts will partner with Waterloo Community School District and the University of Northern Iowa's College of Education, focusing to improve the content and pedagogical knowledge of Iowa math and science in-service and pre-service teachers. Teaching artists trained by the John F. Kennedy Center for the Performing Arts will lead project activities, focusing on in-depth professional development workshops. Project activities include: three-hour participatory workshop for pre-service and in-service teachers; college classroom demonstrations; K-8 classroom demonstration with teachers attending the three-hour workshop; in-service teachers observing K-8 classroom demonstration

Amount Requested: \$ 53,371 FY2010

Principal Investigator: Amy Hunzelman, Director of Education & Special Programs
Gallagher-Bluedorn Performing Arts Center
University of Northern Iowa

Collaborators: Waterloo Community School District
University of Northern Iowa's College of Education

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- **2009/2010 IT-Adventures**

Description: IT-Adventures is a partnership forged between Iowa State University, the Technology Association of Iowa (TAI), the Iowa chapter of INfraGard, IT industries and Iowa businesses. The program, which is in its second year, is dedicated to increasing interest in and awareness of information technology among high school students across the state using three content areas including cyber defense, robotics and game design programming. We use an inquiry-based approach which allows students to explore IT in a non-threatening experimental environment. This method will increase the number of high school students who are interested in IT; increase the number of undergraduates enrolling to study IT in community colleges and four-year institutions; and increase the number of IT graduates who enter the work force.

Amount Requested: \$ 60,377 FY2010

Principal Investigator: Doug Jacobson
Associate Professor - Electrical and Computer Engineering
Director – Information Assurance Center
Iowa State University

Collaborators: Technology Association of Iowa
Iowa Chapter of INfraGard
IT industries and Iowa businesses

- **Go!: Using an online magazine to convey real-world math and science concepts related to transportation**

Description: This exploratory project will encourage teens to develop their science, technology, engineering, and math (STEM) skills in relation to transportation. It will do this by helping grow Go!: Exploring the world of transportation, a free online magazine for teens published by Iowa State University since 2007. Published six times per school year, Go! will explicitly incorporate STEM content in three to four articles and one hands-on, STEM-related activity per issue. Each issue will also be translated into Spanish to appeal to Iowa's growing Latino population. A marketing campaign will target Iowa teens, teachers, guidance counselors, media specialists, and parents.

Amount Requested: \$ 48,397 FY2010

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Principal Investigator: Shashi Nambisan, Professor
Department of Civil, Construction, and Environmental Engineering
Director - Center for Transportation Research & Education (CTRE)
Iowa State University

Collaborators: Iowa State's Midwest Transportation Consortium
Participants of the CTRE advisory committee

- **Increasing Educational STEM Opportunities to Middle School Students in Eastern Iowa**

Description: There is a need to increase the quality and quantity of STEM-related programs available to students in the K-12 educational system. The University of Iowa College of Engineering, in collaboration with Kirkwood Community College and Grant Wood Area Education Agency, will implement STEM-based educational programs for middle school students in Eastern Iowa. These programs, Go! Girls College Exploration Day and Gateway Academy, will allow students to get experience with STEM through hands-on and inquiry-based learning methods with the hopes that these students will be inspired to seek an education in a STEM-related field.

Amount Requested: \$ 32,796 FY2010

Principal Investigator: Rebecca Whitaker, Coordinator - K-12 Outreach
College of Engineering
University of Iowa

Collaborators: Kirkwood Community College
Grant Wood AEA 10
Middle school students in Eastern Iowa

- **Taking the Road Less Traveled to Northwest Iowa**

Description: The Program for Women in Science and Engineering at Iowa State University has been offering the Taking the Road Less Traveled Career Conference for 6-12th grade young women for 20 years, reaching over 44,000 students since the project's inception. In collaboration with Western Iowa Technology Community College, the Program for Women in Science and Engineering would like to replicate this one-day career exploration event for 6th-10th grade girls in Northwest Iowa. The conference would be held in November, 2009 at the Sioux City

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Convention Center. Collaborators include Western Iowa Tech., ISU Extension, local school districts, educators, business and industry.

Amount Requested: \$ 14,696 FY 2010

Principal Investigator: Karen Zunkel, Director
Carol Heaverlo, Outreach Program Coordinator
Program for Women in Science and Engineering
Iowa State University

Collaborators: Western Iowa Technology (WIT) Community College
ISU Extension Office
Northwest Iowa Extension offices, school districts, business and industry