

IMSEP Funded Projects FY2009

a collaboration of the University of Northern Iowa, Iowa State University and the University of Iowa

SUMMARY OF PROPOSALS:

Twenty-two proposals **approved for funding** by the IMSEP Executive Board

- 13 – University of Northern Iowa Principal Investigators
- 5 – Iowa State University Principal Investigators
- 4 – University of Iowa Principal Investigators
- 8 – science, 5 – mathematics, 9 – interdisciplinary (STEM)
- Total competitive grant funding for FY2009: \$1,242,857

SUMMARY OF FUNDED PROPOSALS:

Science Education Proposals:

- **Learning Progressions to Support Science Teaching and Learning**

Description:

Learning progressions are descriptions of increasingly sophisticated ways of thinking about or understanding a topic (National Research Council, 2007). They have the potential to significantly impact students' science learning—both by influencing instructional and curricular decisions and by guiding classroom formative assessment practices. Yet, despite this promise, there are still very few examples of empirically-validated learning progressions in science, particularly at the elementary level, and strategies for using assessment items to provide meaningful diagnoses of student thinking with respect to learning progressions remain elusive.

This two-part project draws upon ongoing work on several learning progressions to address each of these two areas of need. In particular, the proposed project would:

- 1) Explore ways in which learning progressions may be used to make meaningful diagnoses of students' scientific understandings and
- 2) Develop learning progressions and associated assessment items for two elementary school science topics – plant nutrition and electricity.

Amount Requested: \$52,047.36 FY2009

Principal Investigator: Alicia C. Alonzo, Assistant Professor of Science Education
College of Education

University of Iowa

Collaborators: colleague at the University of Colorado, Boulder

- **UNI Professional Development and Outreach for Future and Existing High School Physics Teachers**

Description: Future and existing high school physics teachers will engage in relevant and rigorous professional development and outreach experiences. The professional development experiences for university students includes monthly meetings with UNI Physics and Science Education faculty and master high school physics teachers. The project also involves expanding the one-day UNI Physics Update Conference for high school physics teachers to include both students and teachers especially those teachers who have already expressed interest in participating in future UNI professional development programs. The outreach experiences will focus on the UNI/AEA 267 Regional Physics Olympics Competition for high school physics. Support and resources to help prepare for and facilitate the competition are being requested.

Amount Requested: \$28,382

Principal Investigator: Lawrence Escalada, Associate Professor
Departments of Physics and Science Education
University of Northern Iowa
Cedar Falls, IA

Project Actions:

- Recruitment
- Undergraduate Meetings
- UNI Physics Update Conference.
- UNI/AEA 267 Physics Olympics Competition.
- Student Assistants.

- **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: \$143,512 FY2009

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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

- **Energize Me!**

Description: The UNI Center for Energy & Environmental Education (CEEE) and Iowa Public Television (IPTV) will work together to facilitate a series of interactive energy classes for teachers and students via the Iowa Communications Network (ICN). Six sessions for students will be available in both morning and afternoon time periods. The one graduate credit workshop for teachers will consist of nine late afternoon sessions. Topics will include energy efficiency and wind and solar energy. All presentations will be interactive, with participants experimenting with meters, model solar cars and wind turbines, and other materials provided prior to the sessions.

Amount Requested: \$21,833

Principal Investigator: Patricia Higby, Energy Education & Outreach Coordinator
Center for Energy & Environmental Education
University of Northern Iowa
Cedar Falls, IA

Project Actions:

- Enroll at least 20 middle school students in each of the 12 energy efficiency, wind, and solar classes. Enroll at least 15 teachers in the one graduate credit Energize Me! workshop.
- Collaborate with IPTV to promote and schedule 6 ICN classes, repeated in the morning and afternoon, for students and 9 late afternoon ICN sessions for teachers.
- Provide interesting, inquiry based activities that promote the understanding of the scientific principles related to energy for each class and teachers' session.
- Collaborate with ISU, UI, Community Colleges, the Iowa Office of Energy Independence, Iowa Renewable Energy Association, Iowa Renewable Fuels Association, Iowa Wind Energy Association, and energy businesses and industries to find energy professionals willing to share their stories and expertise with teachers and their students

Collaborators: Iowa Energy Center
Iowa Public Television

- **Science Inquiry Teaching**

Description: Science Inquiry Teaching will increase and enhance inquiry science teaching in elementary and middle schools in rural areas of AEA 267. This will be accomplished through supporting instructional materials for kit-based science curricula in schools, expanded kit usage, and professional development for teachers and their administrators on kit resources and the use of science notebooks to integrate literacy and science teaching. A Science Education Update Conference will be held in March 2009 for participants as noted above plus preservice elementary teachers with science minors. An overall science kit users network will be established for conference attendees.

Amount Requested: \$18,321

Principal Investigator: Cherin Lee, Associate Professor
Department of Biology
University of Northern Iowa
Cedar Falls, IA

Project Actions:

- Facilitating increased proficiency in and confidence in teaching a kit-based science curriculum
- Fostering increased fidelity in using science notebooks to enhance literacy skills
- Increasing science literacy of K-8 students
- Establishing networking among science kit users (teachers) and administrators, and preservice teaching majors,
- Enhancing elementary education majors' knowledge of and familiarity with kit-based science curricula and science notebooks
- Science Inquiry Teaching has two major components:
 - a) Facilitating the use of research-based and nationally funded kit-based science curricula by K-8 science teachers, and
 - b) Establishing a network of kit users and providing professional development for teachers, administrators and undergraduate preservice teaching majors on kit resources and the integration of science and literacy.

- **Seamless Transitions into and through Science Teacher Education**

Description: Project focuses on science teacher recruitment and retention through the development of a workshop series for cooperating teachers and university supervisors to address research-based effective science

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teaching practices and to assist beginning teachers on how to implement such practices.

Amount Requested: \$63,696 FY2009

Principal Investigator: Joanne K. Olson, Associate Professor of Science Education
Iowa State University

Collaborators: Iowa State University
Drake University
University Teacher Education Program
Faculty in Science Education
Faculty in Special Education

- **Improving High School Biology Teachers' Pedagogical Content Knowledge Using a Web-Based Video Analysis Tool**

Description: This proposed exploratory project is to support Iowa high school science teachers to improve their pedagogical content knowledge (PCK) through two avenues: a) providing a systematic professional development (PD) and b) enhancing reflection capacity using a web-based video analysis tool (VAT). The PD and reflection will focus on developing two main components of PCK: a) understanding of what difficulties or misconceptions students have in learning specific topics and how to assess them, and b) understanding of teaching strategies as to how to confront student misconceptions and meet learning needs.

Amount Requested: \$53,121 FY2009

Principal Investigator: Soonhye Park, Assistant Professor of Science Education
College of Education
University of Iowa

Collaborators: *none listed*

- **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: \$99,546 FY2009

Principal Investigator: Betty Zan, Director
Regents' Center for Early Developmental Education

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

Mathematics Education Proposals:

• **A Teachers’ Circle for Central Iowa Middle School Mathematics Teachers**

Description: Creation and operation of a Teachers’ Circle (*a group of teachers and mathematicians who meet regularly to learn about problem solving activities*) for some central Iowa middle school mathematics teachers.)

Amount Requested: \$49,915 FY2009

Principal Investigator: Elgin Johnston, Professor of Mathematics
Iowa State University

Collaborators: ISU’s Research Institute for Studies in Education (RISE)

• **Number Sense 1: Mathematics Professional Development for Elementary Teachers**

Description: The purpose of Number Sense 1: Mathematics Professional Development for Elementary Teachers is to leverage products previously created through federal appropriations to provide quality professional development for teachers in Iowa. This project proposes to modify an existing professional development course to align with the Iowa Core Curriculum, Every Student Counts, and the Iowa Professional Development Model. Area Education Agency Mathematics consultants will then facilitate this course for a maximum of 25 teachers in Northwest Iowa.

Amount Requested: \$48,290

Principal Investigator: Vicki Oleson, Instructor
Department of Mathematics
University of Northern Iowa
Cedar Falls, IA

Project Actions:
- Modify and rename *Building a System of Tens* to reflect Iowa initiatives.

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- Present a two- (clock) hour administrator module describing the modified course for principals in districts where teachers will receive the professional development.
- Facilitate this course in AEA 8 for a maximum of 25 teachers in Northwest Iowa.

- **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: \$82,879 FY2009

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

Collaborators: ISU Lab School
University of Northern Iowa
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: \$43,613 FY2009

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

Collaborators: Grant Wood Area Education Agency

- **Traversing Parallel Lines: A Long Distance Pilot Partnership to Articulate Geometric Problem Solving for Students and Enable Action Research for Teachers**

Description: Guided by two expert high school geometry teachers, two classes of students—one in Iowa and one in Boston—will discuss geometric concepts through distance education technologies. The goal of this project is to link writing and mathematics and investigate the effect of language on understanding and performance in mathematics. The research team is cross-disciplinary: one professor of mathematics, one professor of English, two teachers, and sixty in two very different geographic areas.

Amount Requested: \$50,018 FY2009

Principal Investigator: Bonnie Sunstein, Professor of English and Education
College of Education
University of Iowa

Collaborators: Colleague at Revere High School, Revere, MA
Colleague at City or West High School, Iowa City, IA
Colleague at American College Testing (ACT)
Intra-university between disciplines at University of Iowa

STEM Education Proposals:

- **STEM in the Afternoon – an after school club for elementary and middle school students**

Description: This project involves a science, technology, engineering and math (STEM) after school club for upper elementary and middle school students to be located at Price Laboratory School (PLS). High school students and University of Northern Iowa (UNI) undergraduate teaching majors will be recruited as assistant teachers. The goals of this program will be to: 1) Inspire and motivate students to pursue knowledge and ultimately careers STEM or the education of students in these areas, 2) Provide a venue for authentic experiences and professional development and 3) Utilize the internet to disseminate what we learn to other's.

Amount Requested: \$24,860

Principal Investigator: Alison Beharka, Assistant Professor of Teaching and Price Lab School Educator
University of Northern Iowa and Price Lab School
Cedar Falls, IA

- Project Actions:
- Participant Recruitment
 - Parent/Student/Faculty Meetings
 - UNI and High School Assistants and science/mathematics education students
 - Club Meetings
 - Club Wiki
 - Website

- **The Carmen Sosa Farming Curriculum Project: A Planning Grant Towards Bridging Informal and Formal Math and Science Education to Enhance Talent Expansion and Teacher Performance and Recruitment in Iowa’s Demographically-Transitioning Communities**

Description: This planning project proposes to develop inter-institutional and statewide collaboration around the use of the Marshalltown Community College farm as a site from which to develop rich, literacy-infused curriculum that links the informal mathematics and science learning afforded by farm-based activity to the formal school-based math and science programs of study. The larger purpose of the project is to, drawing on a community-based “funds of knowledge” framework, enhance math and science learning for culturally- and linguistically-diverse youth, as well the pedagogy of their teachers, and broaden opportunities for career exploration.

Amount Requested: \$49,085 FY2009

Principal Investigator: Katherine Richardson Bruna, Assistant Professor
Department of Multicultural and International Curriculum Studies
Iowa State University

Collaborators: Marshalltown Community College
Other collaborations between universities, colleges, school districts

- **Iowa Student STEM Symposium**

Description: Symposium bringing students and teachers together to increase the number of students taking mathematics and science courses in high schools; to attain a higher level of achievement from students taking mathematics and science; and to inform a greater number of students about careers in mathematics and science.

Amount Requested: \$70,197 FY2009

Principal Investigator: Lyn Le Countryman, Professor

Biology and Science Education
University of Northern Iowa

Collaborators: Iowa Mathematics and Science Coalition

- **Research Avenues for Iowa Science Educators (RAISE) and Research Experiences for Teachers (RET): A Collaboration on How Research Based Professional Development Internships Influence Science-Technology-Engineering-Mathematics (STEM) Teaching**

Description: The increasing demand for meaningful professional development for teachers has led to multiple programs in the sciences which provide authentic research experiences for secondary science teachers. In the state of Iowa there are currently, two known, established programs which provide research experiences for secondary science teachers: Research Avenues for Iowa Science Educators (RAISE) at the University of Northern Iowa and Research Experiences for Teachers (RET) at Iowa State University. This proposal seeks to establish collaboration between the existing programs through two one-day workshops with the intent to: 1) Evaluate the implementation of inquiry based teaching and learning as a result of a professional development STEM research experience, 2) Create a forum for teachers who have participated in a professional development STEM research experience to share best practices relating to implementation of scientific inquiry into STEM curricula, and 3) Lay the groundwork to establish a centralized network of STEM research programs for teachers at the three Regent's institutions. Workshops involve key note speakers, presentations by former participants of RAISE and RET, and facilitated discussions of classroom implementations.

Amount Requested: \$45,982 FY2009

Principal Investigator: Dawn Del Carlo, Assistant Professor
Department of Chemistry and Biochemistry/Science Education
University of Northern Iowa

Collaborators: Iowa Mathematics and Science Coalition
Three Regents Universities – State of Iowa

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

Description: Professional development workshops for classroom teachers and education students to master learning objectives in both the subject area and the art form.

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Amount Requested: \$54,575 FY2009

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

Collaborators: GBPAC
Waterloo Community School District
John F. Kennedy Center for the Performing Arts

• 2009 IT – Olympics

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: \$43,200

Principal Investigator: Doug Jacobson, Professor
Electrical and Computer Engineering
Iowa State University
Ames, IA

Project Actions:

- A two-day competition called the IT-Olympics on April 20-21, 2009, in Hilton Coliseum on the ISU campus. The 2009 goal is 500 students representing 50 high schools showcasing the IT knowledge they have gained during the year in competitions and presentations.
- A year-long teacher distance education component to the IT-Adventures program which culminates with a workshop during IT-Olympics.
- Web survey of the students participating in the IT-Adventures program (post-test)

Collaborators: Technology Association of Iowa

Des Moines Area Community College
Iowa Public Television
ISU Toying with Technology Program
Various Iowa Businesses

- **Math-Science-Engineering Technology in Iowa on Applied Renewable Energy Areas (MSETI – AREA)**

Description: Provide area teachers with an applied Mathematics and Science curriculum package based on Photo-Voltaic (PV), wind power and hydrogen fuel-cell fundamentals. Utilize the energy bike “UNI e-Bike” project which will be introduced through a series of weekend professional development workshops.

Amount Requested: \$78,867 FY2009

Principal Investigator: Recayi ‘Reg’ Pecen, Associate Professor of Industrial Technology
Coordinator of the Young Scientists’ Camp
University of Northern Iowa

Collaborators: UNI College of Natural Sciences
Cedar Falls-Waterloo community schools, specifically NI Price Lab School, Holmes Junior High School and Waterloo community schools

- **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: \$67,860 FY2009

Principal Investigator: Angela Francis, Academic Advisor
Upward Bound Mathematics and Science Department
University of Northern Iowa

Collaborators: Iowa State University
University of Iowa
University of Northern Iowa

- **Planning for Success in STEM for Students with Disabilities: A Working Conference**

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Description: A two-day working conference with follow-up publication to stimulate dialog to 1) improve attitudes toward, 2) investigate ways to better support and 3) plan accommodations/supports for students with disabilities who have interests in Science, Technology, Engineering and Mathematics, in secondary and post-secondary settings.

Amount Requested: \$53,058 FY2009

Principal Investigators: Audrey C. Rule, Associate Professor of Curriculum and Instruction
Greg P. Stefanich, Professor of Curriculum and Instruction
University of Northern Iowa

Collaborators: *None indicated*