

Annual Report for Period:03/2007 - 02/2008

Submitted on: 11/30/2007

Principal Investigator: Smith, Rosemary J.

Award ID: 0638684

Organization: Idaho State University

Title:

Continuing, GK-12: Enhancing Science Literacy in Southeast Idaho with Community-based Projects and University/K-12 Partnerships

Project Participants

Senior Personnel

Name: Smith, Rosemary

Worked for more than 160 Hours: Yes

Contribution to Project:

Project Director- directs all project activities including recruitment and selection of Fellows and Teachers, summer workshop, budget, monthly project activities, publicity, reports, and evaluation.

Name: Stout, Lawrence

Worked for more than 160 Hours: Yes

Contribution to Project:

Recruit and select Fellows and Teachers, mentor Fellows, engage in partnership and project activities, including seminar, monthly meetings, special events and activities, budgeting, evaluation process, and reporting.

Name: Hill, Jeffrey

Worked for more than 160 Hours: Yes

Contribution to Project:

Recruit and select Fellows and Teachers, mentor Fellows, engage in partnership and project activities, including seminar, monthly meetings, special events and activities, budgeting, evaluation process, and reporting.

Name: Ellis, Mickle

Worked for more than 160 Hours: Yes

Contribution to Project:

Recruit and select Fellows and Teachers, mentor Fellows, engage in partnership and project activities, including seminar, monthly meetings, special events and activities, budgeting, evaluation process, and reporting.

Name: Sanger, Hannah

Worked for more than 160 Hours: Yes

Contribution to Project:

Project Coordinator: Coordinates all project activities, including Fellow and Teacher applications and enrollment, stipend distribution, classroom activity budget disbursement, participant and PI travel, media relations. Coordinates and contributes to summer workshop and monthly meetings. Maintains project website and communications. Compiles information for annual evaluations and reports.

Name: Sievert, Regina

Worked for more than 160 Hours: Yes

Contribution to Project:

External Evaluation

Name: Hartle, Todd**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Evaluator- written and oral communication

Post-doc

Graduate Student

Name: Blackmore, William**Worked for more than 160 Hours:** Yes**Contribution to Project:****Name:** Cannon, Jennifer**Worked for more than 160 Hours:** Yes**Contribution to Project:****Name:** Jones, Maurita**Worked for more than 160 Hours:** Yes**Contribution to Project:****Name:** Kihara, Ian**Worked for more than 160 Hours:** Yes**Contribution to Project:****Name:** Kingsbury, Esther**Worked for more than 160 Hours:** Yes**Contribution to Project:****Name:** Naegle, Erin**Worked for more than 160 Hours:** Yes**Contribution to Project:****Name:** O'Hearn, Pam**Worked for more than 160 Hours:** Yes**Contribution to Project:****Name:** Parsons, Sue**Worked for more than 160 Hours:** Yes**Contribution to Project:****Name:** Sheeley, Nicole**Worked for more than 160 Hours:** Yes**Contribution to Project:****Name:** Smith, Chris**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Name: Wisniewski, Nicole

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate Student

Technician, Programmer

Other Participant

Research Experience for Undergraduates

Organizational Partners

Pocatello High School

Partnering K-12 School

Highland High School

Partnering K-12 School

Century High School

Partnering K-12 School

Franklin Middle School

Partnering K-12 School

Skyline High School

Pocatello Community Charter School

Partnering K-12 School

Marsh Valley High School

Partnering K-12 School

Other Collaborators or Contacts

2007 SUPPORTERS

Pocatello Education Foundation - Probeware - \$4800

Glock Corporation - Robotics - \$1000

Marsh Valley School Fundraising - Robotics - \$1700

Franklin MS Parents - Robotics \$400

AMIS - Robotics - \$5200

Franklin Middle School - Robotics - \$200

Simplot - Robotics & Chemistry \$1250

Simplot - Chemistry - glasware

Century Highschool Fundraising - Robotics - \$300

Lowe's - Robotics - wood discount

Idaho National Laboratory - \$20,000

Lithia Education Foundation \$243

ADDITIONAL SUPPORTERS 2007
Central Virginia College
Bingham Memorial Hospital
Portneuf Valley Family Center
Heinz
Alameda Automotive
Freeman Carpet Cleaning
Maguire and Kress Law Firm

Activities and Findings

Research and Education Activities: (See PDF version submitted by PI at the end of the report)

Please see attached pdf file.

Findings:

Please see file under Activities.

Training and Development:

See file under Activities.

Outreach Activities:

See file under activities.

Journal Publications

Books or Other One-time Publications

Web/Internet Site

Other Specific Products

Contributions

Contributions within Discipline:

Contributions to Other Disciplines:

Contributions to Human Resource Development:

Contributions to Resources for Research and Education:

Contributions Beyond Science and Engineering:

Special Requirements

Special reporting requirements: None

Change in Objectives or Scope: None

Animal, Human Subjects, Biohazards: None

Categories for which nothing is reported:

Any Journal

Any Book

Any Web/Internet Site

Any Product

Contributions: To Any within Discipline

Contributions: To Any Other Disciplines

Contributions: To Any Human Resource Development

Contributions: To Any Resources for Research and Education

Contributions: To Any Beyond Science and Engineering

Idaho State University GK-12 Annual Report (2007)

Note: This report is for the first eight months (March 1–Nov 30, 2007) of the ISU Continuing GK-12 grant.

Project Summary

2007-2008 academic year: Our new (continuing) GK-12 grant brought some changes to our project, primarily the exclusive participation of graduate fellows. We selected 11 Fellows from Biological Sciences, Geosciences, Chemistry, and Engineering and partnered them with 12 teachers (one Fellow is partnered with two teachers). The Fellows and Teachers remain partners for the entire academic year, with Fellows spending 10 hours per week in the classroom, and 5 hours preparing. Fellows and Teachers participate in ongoing professional development, including an intensive summer workshop, monthly participant meetings, and responding to prompts in an on-line journal. Although the partnerships have only been in the schools for 10 weeks, they have brought locally-relevant science and engineering activities to students, with an emphasis on the research in the Fellow's area of expertise. As in the first three years of the project, we are evaluating improvements in the Fellows' written and oral communication skills. We have selected a new project evaluator who will assist with measuring changes in the participants' understanding of science and engineering topics, acquisition of new science teaching skills, attitude towards implementing inquiry in the classroom, and broader outcomes related to institutional change. As in past years, ISU's GK-12 received media attention, which helped in attracting interest and financial support from ISU's administration, school district leaders, and local businesses and organizations for continuation of the project's activities.

1.) Goals and Activities

In our continuation proposal we defined an evaluation plan to use as part of our ongoing and annual evaluation activities. This plan allowed us to look at specific indicators for each part of our project, and use these outcomes to determine our progress towards our overall goals. Although these are not limited to research and education activities, they are essential to the progress of the project. The first part of the formative assessment plan was to look at structural aspects of the grant, for which we had specific questions and indicators. These aspects included the fellow and teacher selection process, project management structure, partnership activities, summer workshop, monthly meetings, on-line journal (to measure communication skills), and research associated with the ISU GK-12 project. We are currently working with a new External Evaluator (see attached report) to prepare an evaluation design, using mixed methods, to collect and analyze the data.

The structural aspects of the project were improved based on the previous formative assessments. The Fellow and Teacher recruitment and selection process went very smoothly, the summer workshop was likewise well-received, and the monthly meetings are structured to include more break-out groups relevant to the participant's perceived needs and more opportunities for the Fellows to present their research topics and integrative science lessons. Both Teachers and Graduate Fellows reported spending at least 10 hours/week in the classroom conducting activities, and Fellows spent additional hours preparing for these activities. Fellows and teachers also spent time during each week and during the monthly meetings collaborating on STEM

activities. A few ISU faculty mentors visited classrooms, provided specialized equipment and expertise, and supported the activities of the graduate student or undergraduate Fellows. Local businesses and organizations provided logistical support for projects, funding, and mentors (particularly for the robotics teams, but also for the environmental monitoring). The project management structure is efficient and capable.

General activities of the project and involvement of fellows, teachers, and institutions in these activities:

- a. Training, workshops, seminars. All participants (fellows, teachers, PI's, and the Project Coordinator) participated in the one-week summer workshop as well as the two-hour monthly meetings. The workshop included activities to: introduce the ISU GK-12 project goals and expectations, provide tools and training to build successful teacher-scientist partnerships, introduce the Idaho science standards, learn to distinguish and adapt inquiry-based lessons, and reflect on the cultural similarities and differences between teachers and scientists. In addition, Fellows discussed "How People Learn" and the basics of inquiry-based teaching, while teachers learned about the varied scientific resources available at ISU. Many of these activities were extended into the monthly meetings held throughout the academic year. Based on input from previous years, we added new monthly activities: at each meeting we have two Fellows either present a lesson or provide a brief research talk. The lessons allow them to practice and receive constructive criticism on their teaching, and the research talks serve the dual roles of having them practice communicating their research to a broad audience and to have the teacher partners have a better grasp of the range and depth of research conducted by the graduate student Fellows. Fellows also participate in an additional monthly meeting, led by an ISU faculty member and the Project Director, which focused on "How People Learn", inquiry-based teaching, and strategies to measure the effectiveness (impact on student learning) of their lessons. All Fellows and teachers contributed regularly to an on-line journal, providing them with bi-weekly opportunities to communicate their ideas.
- b. Curriculum materials adopted or developed. One of the lessons learned during the first years of the project was that it is best to not prescribe the topics, but rather to encourage Fellows and teachers to work together to build on the content-area strengths of the Fellow and the need of the individual teacher. Fellows and teachers were loosely associated with specific areas (Environmental sciences, Portneuf River Project, FIRST robotics and FIRST LegoLeague robotics), but many have developed classroom-based research projects closely allied with the Fellows' research. All GK-12 fellows are required to write two to three lesson plans that they create or adapt (these are available on the project website). A few of the activities that have occurred this Fall semester are highlighted:
 - A Fellow from Biological Sciences, with research on snake population genetics and conservation, planned a field trip with high school biology students to collect rattlesnakes in a protected area at the nearby Idaho National Laboratory. Subsequently students took tissue samples, extracted DNA, and mapped the location of the snakes onto a GIS map of the region.

- A Fellow from Geosciences accompanied third and fourth grade students on a field trip to Yellowstone National Park, where they studied hot-pots, geysers, and other geological features. The students are currently preparing for a Science Activities event, open to the public, in which they demonstrate their understanding of geological concepts.
- A Fellow with research in avian anatomy and physiology partnered with a teacher to produce a unit on Avian Flu, complete with activities dissecting lungs, studying bird migration routes, and making models of flu viruses.
- A Fellow in Chemistry is designing a series of activities for students to determine the anti-microbial properties of nanoparticles of silver.
- A Fellow in Engineering worked with high-school students on the design and building of a “trebuchet”, with which they competed in a regional pumpkin-toss (earning 2nd. Place overall).

2.) Communication- publications, presentations, and websites associated with project activities.

- a. Journal publications:
Ray, A. and P. M. Beardsley. *In press*. Overcoming student misconceptions in photosynthesis: a model and inquiry-based approach using aquatic plants. *Science Activities*.
- b. Conference presentations: none from continuation grant.
- c. Website developed: www.isu.edu/departments/gradk12/
- d. An ISU-GK-12 Project Newsletter was developed, emailed and mailed to participants (past and current), collaborators, administrators, and the media.
- e. Media attention: A selection of articles can be found on the project website.

Research Activities.

Dr. Todd Hartle completed his doctoral dissertation research on the ISU GK-12 partnerships. He was awarded a Doctor of Arts in Biology degree by ISU in August 2007. Manuscripts based on this dissertation are being submitted in Fall 2007.

Title: A collection of research reporting, theoretical analysis, and practical applications in science education: examining qualitative research methods, action research, educator-researcher partnerships, and constructivist learning theory.

External Evaluation Plan

**Evaluation Plan
Idaho State University – GK-12 Program
Academic Year – 2007-08**

The external evaluation is being conducted by Dr. Joan LaFrance and Ms. Regina Sievert of Mekinak Consulting in partnership with internal evaluators at Idaho State University. Mekinak Consulting uses a participatory approach in doing evaluation. We believe evaluation planning should be done in partnership with major stakeholders (program staff, teacher and fellows, and school administrators). Although the evaluators are primarily responsible for the planning and execution of the evaluation, we encourage the review of our initial conceptualization of the program and inclusion of views of program staff and participants regarding the program’s theory, assumptions, evaluation questions, and data collection instruments.

Relationship of the Program’s Activities to Short and Long Term Outcomes

The overall goal for the project is to: *strengthen and sustain ISU GK-12 using a framework that will improve STEM education (for all participants) through the use of:*

- 1) inquiry-based learning and*
- 2) content/issues that are relevant, both in local civic terms and to local industry.*

To achieve this goal, the planning group devised five measurable objectives for the project.

Table 1 is a logic model that connects each of these outcomes to short and long term outcomes.

Table 1: Objectives and Outcomes

Objectives of Program Activities	Short term outcomes	Long term Outcomes
1. Each year recruit, select and train 11 GK-12 Graduate Fellows that reflect regional diversity to serve as science resource specialists for K-12 educators.	1a) Each year, 11 Fellows participate in the program 2a) Fellows reflect regional diversity and serve as role models for K-12 students	<ul style="list-style-type: none"> ▪ Increase in the number of students of underrepresented groups who attend ISU to pursue STEM degrees
2. Mentor Fellows and teachers and assess the impact of the program on Fellows’ communication skills, partnership skills, and professional opportunities. Mentoring will be done by ISU faculty and the Project Coordinator.	2a) Fellows are mentored by project personnel. 2b) Fellows demonstrate improved communication skills 2c) Fellows demonstrate improved pedagogical skills 2d) Fellows demonstrate improved abilities to work in partnership with teachers 2e) Fellows report that GK-12 experiences enhance their professional opportunities 2f) Fellows demonstrate increased interest and confidence in STEM teaching 2g) Teachers report benefits in content knowledge and pedagogical skills from working with Fellows and GK-12 project 2h) Teachers report benefits of strengthened collaboration with ISU 2i) ISU faculty mentor fellows and increase involvement with K-12 education	<ul style="list-style-type: none"> ▪ Increase in the number of Fellows who continue involvement in K-12 STEM education after their participation in the GK-12

Objectives of Program Activities	Short term outcomes	Long term Outcomes
3. Fellows, in partnership with teachers, provide hands-on, inquiry based instruction in science in general and science relevant to their discipline.	3a) Teachers and Fellows collaborate in the design and teaching of inquiry based instruction, especially on issues relevant to local area and Fellows' research 3b) Students in GK-12 classrooms demonstrate increased interest in and improved attitudes toward science 3c) Students experience positive interactions with scientists in class 3d) Students demonstrate enhanced understanding of science and engineering	<ul style="list-style-type: none"> ▪ Teachers increase the use of inquiry based relevant content lessons in their regular science curriculum ▪ Number of students recruited from GK-12 schools into science degrees at ISU increases ▪ Student pursuit of science careers, especially with local companies, increases
4. Provide an on-going structure to manage efforts, provide organization and direction to the program, and evaluate and disseminate program results. Evaluation will be both internal and external, with particular attention paid to the impact on Fellows' communication skills, and the impact on K-12 teaching/student learning.	4a) The program is managed well 4b) A partnership between internal and external evaluators generates information to both improve the program and determine how well it is meeting goals and objectives 4c) Program results are disseminated to the K-20 education community	<ul style="list-style-type: none"> ▪ Lessons learned from the ISU GK-12 are applied to other education related efforts
5. Develop the foundation from which to sustain the program. This will involve implementing GK-12 type activities into regular T.A. and R.A.-ships, integrating graduate training in professional and informal communication, providing seminars on how people learn and teaching strategies that reach all students, and opportunities and infrastructure to partner with teachers and students in science and engineering activities.	5a) ISU institutionalizes opportunities GK-12 school partnership activities into ongoing university programs 5b) ISU institutionalizes courses/seminars designed to improve communication skills of graduate students in the science fields. 5c) ISU institutionalizes courses/seminars in teaching & learning for graduate students in science fields	<ul style="list-style-type: none"> ▪ GK-12 activities are sustained by ISU STEM departments after project ends

Major Evaluation Questions

The evaluation addresses the following major questions:

- 1) How have Fellows benefited from participation in the ISU GK-12?
- 2) How have teachers, classrooms, and schools benefited from partnering with the ISU GK-12 program?
 - increased content knowledge and confidence in teaching STEM,
 - enhanced professional development opportunities, including mentoring of Fellows,
 - strengthened collaboration with ISU.
- 3) How have students benefited from working with GK-12 Fellows?
 - improved attitudes towards learning STEM,
 - positive interactions with scientist role models and
 - enhanced understanding of science and engineering.
- 4) What evidence is there of sound project management and fidelity of project

implementation?

- 5) How has ISU built foundations within its departments to sustain GK-12 activities?
 - increased participation in K-12 outreach activities by ISU faculty,
 - interdisciplinary interactions among faculty and Fellows,
 - inclusion of educational activities in graduate programs, and recruitment of STEM students to ISU.
 - community: Increased participation by businesses/organizations in collaborative educational

These questions will be addressed in an evaluation design that relies on mixed methods to collect and analyze data. Data collection will be done in partnership with internal and external evaluators. The following table describes the evaluation questions, indicators, data needed, responsibilities for this data.

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Idaho State University GK-12 Evaluation Plan

Evaluation Questions	Indicators	Data needed	Responsibility	Timeline
How have Fellows benefited from participation in the ISU GK-12?				
Did Fellows' skills in communicating with teachers and students about STEM improve?	Writing samples	Writing samples rubric scores	ISU Writing Center External evaluators	
Did Fellows' attitudes toward, and confidence and interest in teaching STEM improve?	Fellows' attitudes and perceptions	Fellows interviews analysis	External evaluators	Oct 07 and Spring 08
Did Fellows' ability to effectively teach and apply STEM improve?	Teachers' perceptions	Teacher's interviews analysis Teachers' journal	External evaluators Internal evaluators	Interviews Oct. 07 and Spring 08
Did Fellows increase their understanding of the benefits of building strong partnership between IHE and K-12 schools?	Fellows' perceptions	Fellow interviews analysis	External evaluators	Oct. 07 and Spring 08
How have teachers, classrooms and schools benefited from partnering with the ISU GK-12 program?				
Did teachers' STEM content knowledge increase?	Teachers' perceptions	Teacher interviews analysis Teacher surveys results	External evaluators Internal evaluators administer; external evaluators analyze	Spring 08
Did teachers' confidence in teaching STEM increase?	Teachers' perceptions	Teacher interviews analysis Teacher surveys results Teachers' journals	External evaluators Internal evaluators administer, external evaluators analyze	Spring 08
Did teachers perceive the PD opportunities provided by the ISU GK-12 to be valuable to their professional growth and classroom instruction?	Teachers' perceptions	Teacher interviews analysis Teacher surveys results Teachers' journals	External evaluators Internal evaluators administer, external evaluators analyze	Spring 08
How do administrator's view the contribution on GK-12 to their schools?	Administrator's perceptions	Letter/email comments from administrators	Internal evaluators	Spring 08

How have students benefited from working with a GK-12 Fellow?				
Did students' attitudes toward learning STEM improve?	Students' attitudes	Student surveys	External evaluators analyze results Internal administration	Oct. 07 and Spring 08
Did students experience positive interactions with scientist role models?	Students' perceptions	Student surveys	External evaluators analyze results Internal administration	Oct. 07 and Spring 08
Did students' understanding of science and engineering improve?	Students' perceptions	Student surveys	External evaluators analyze results Internal administration	Oct. 07 and Spring 08
What evidence is there of sound project management and fidelity of project implementation?				
Was the Fellow and teacher selection process adequate?	Number of applicants Match of Fellows/teachers Committee process Fellows' diversity	Count of applications Survey of Fellows/teachers Survey of committee Fellows' demographic information	Project PIs and Project Coordinator	
Was the summer workshop valuable to participants?	Number of participants Participant satisfaction Instructor satisfaction	Count of participants Participant survey results Instructor survey results	Project PIs and Project Coordinator	
Were the monthly meetings valuable to participants?	Participant satisfaction	Fellow surveys Teacher surveys ISU faculty surveys	Project PIs and Project Coordinator	
Did the graduate Fellows fully participate in school activities?	Fellows' activities Teacher perceptions	Fellows' activity logs Teacher survey results	Project PIs and Project Coordinator	
Did the Fellows and teachers collaborate on implementing STEM activities?	Activities of Fellows and Teachers	Fellow survey results Teacher survey results Teacher interviews analysis	Project PIs and Project Coordinator	
Did ISU faculty participate in GK-12 activities?	ISU faculty activities	Surveys of STEM faculty	Project PIs and Project Coordinator	
To what extent did local businesses and organizations participate in the projects?	Community partner activities	List of participants Summary of community partners' participation	Project PIs and Project Coordinator	

How has ISU built foundations within its departments to sustain GK-12 activities?				
Was there an increase in the participation of ISU faculty in K-12 activities as a result of the GK-12?	ISU faculty activities	Focus group with STEM faculty Graduate dean interview	External evaluators	Sp 08
How did the GK-12 influence interdisciplinary interactions between ISU faculty members as a result of GK-12 activities?	ISU faculty activities	Focus group with STEM faculty Graduate dean interview	External evaluators	Sp 08
Has the GK-12 influenced the K-12 educational outreach activities of the graduate programs at ISU?	Departmental graduate program activities	Focus group with STEM faculty Graduate dean interview	External evaluators	Sp 08
Has the number of recruits into STEM programs from GK-12 schools increased?	Student recruit demographics	Departmental student records	Project PIs and Project Coordinator	Sp 08

External Evaluator Tasks and Schedule

Tasks	2007				2008						
	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July
Development/Revision of Data Collection Tools											
Fellows surveys	X										
Student attitude surveys		X									
Pre interview protocol for Fellows		X									
Post interview protocol for Fellows					X						
Focus group protocol for Fellows					X						
Pre interview protocol for Teachers		X									
interview protocol for Teachers					X						
Focus group protocol for STEM faculty					X						
Grad dean interview protocol					X	X					
Data Collection Activities											
Fellows pre-interviews		X	X								
Fellows post interviews								X			
Teacher interviews								X	X		
STEM faculty focus group								X			
Grad dean interview								X			
Analysis and Reporting											
Data analysis			X	X				X			
Report writing			X	X					X	X	
Administrative Tasks											
Communications	X	X	X				X	X	X		
Scheduling for observation/data collection		X					X				
General administration (including attending meetings)		X						X			