

Letter of Intent
2006 NSF – Graduate Teaching Fellows in K-12 Education (GK-12) Program

Title of Project: Oregon State University GK-12: ‘Be A Scientist’ in Rural Oregon

PI/Co-PI: Sujaya Rao / Ed Jensen

Faculty advisors and departments involved:

Name	Role in Project	Discipline / Department
S. Rao	PI	Entomology / Crop and Soil Science
E. Jensen	co-PI	Ecology & education / Forest Resources
D. Wooster	Faculty Resource	Aquatic ecology / Fisheries and Wildlife
E. Sulzman	Faculty Resource	Soil ecosystems/ Crop and Soil Science
H. Stotz	Faculty Resource	Post harvest technology / Horticulture
J. Noller	Faculty Resource	Soil mapping / Crop and Soil Science
M. Dragila	Faculty Resource	Hydrology/ Crop and Soil Science
P. Hayes	Faculty Resource	Plant breeding / Crop and Soil Science
R. Halse	Faculty Resource	Botany / Botany and Plant Pathology
S. DeBano	Faculty Resource	Ecology / Fisheries and Wildlife
E. Davis-Butts	Collaborator	Education / SMILE Program
M. Dalton	Collaborator	Education / School of Education
R. Collay	Collaborator	Education / SMILE Program
S. Bottoms	Collaborator	Education / SMILE Program

Number of graduate fellows per year: 10

Number of K-12 classes anticipated to be served per year: 15-20

Number of K-12 teachers working with the fellows: 10-15

School District Partners: (SD = School District; Superintendents in parenthesis): Alsea SD (J. Larson); Central Linn SD (M. Harrell); Hermiston SD (J. Nelson); Falls City SD (P. Tarzian); Grant SD (N. Cleaver); Great Albany SD (P. Bedore); Lebanon Community SD (J. Robinson); Monroe SD (R. Crowson)

Target audience of the project (middle, high or elementary grades): Elementary and Middle School

Setting (urban, suburban or rural): Rural

NSF supported disciplines or theme(s) involved: Biological Sciences (Organismal and suborganismal), Environmental Sciences

Project Description: In the Track I GK-12 program (2002-2005), OSU Fellows developed and implemented inquiry-based hands-on activities in rural schools near Corvallis. In the current proposal we will build on our Track I successes and extend the program regionally, nationally, and globally. OSU Fellows will provide rural students with a scientist's experience to generate excitement about science, change stereotypic perceptions of scientists, and provide rural youth access to advances in science and technology to prepare them for tomorrow's global competition. OSU Fellows will develop and implement inquiry-based hands-on, experiential activities that are: 1) based in the environments surrounding participating schools, and involving local communities (place-based), 2) connected with OSU research, and 3) linked to schools globally.

This is a resubmission of the 2005 Track II proposal which was **Recommended for Funding** by the review panel but not funded. Reviewer comments include: "The panel was impressed with both the intellectual merit and broader impact of proposal"; "Breadth of STEM areas that were included in the effort was impressive"; "The focus on rural schools and the reach that the Track I had were viewed as strengths"; "The Science Blitz effort was considered to be a "creative addition", "an important model for rural initiatives" and an approach "that other programs with an opportunity to serve remote areas might emulate"; "the willingness of local communities to provide accommodation for fellows is also indicative of a high level of community support". The evaluation plan was considered to be "first-rate" by one reviewer as "qualitative and quantitative metrics are tied directly to the goals, objectives and activities". The NSF Program Manager encouraged resubmission; she indicated that the proposal had merit but was not funded due to funding limitations. As with other programs, many proposals funded in 2005 represented resubmissions. She also indicated that, while universities can submit New Awards in the future, this is last year for submission of renewals ('Continuing Projects'), such as the current proposal.

Goals and objectives: Goals for each of the diverse groups collaborating in the project are to:

1. (OSU graduates) Add value to their graduate experience by enhancing science communication skills and professional development opportunities
2. (Rural K-12) Enrich rural science education by integrating scientific inquiry with landscapes surrounding schools, with university research, and with international schools
3. (Rural Teachers) Involve rural science teachers in professional learning communities and professional development workshops
4. (OSU faculty) Institutionalize GK-12 opportunities at OSU for program sustainability

Project Plan: Ten OSU Fellows will be selected each year and provided the following training in the summer: 1) Three-week summer course covering inquiry-based learning, rural community characteristics, student engagement, curriculum design, etc., 2) Week-long team building workshop organized by SMILE, and 3) Three-day planning retreat with teachers for discussions on schedules, classroom resources, dress codes, etc. In addition, during a Special Topics course each term, topics covered in summer will be revisited, and challenges faced will be addressed.

Place-based Approach and Integration with University Research: OSU Fellows will be placed in rural schools for developing lessons that will involve the local landscape and be connected with university research. To provide rural students with a scientist's experience, they will guide them through activities that scientists engage in: asking questions, designing experiments, conducting investigations, collecting data, drawing conclusions, and presenting results to peers.

This approach was piloted in 2005-2006 in 3 schools through the Discovering Partners in Nature Program funded by Toshiba America Foundation (TAF). An OSU graduate student

guided students as they collected flowers and trapped bees around schoolyards, and developed these into a permanent collection at each school. Students visited the scanning electron microscope at OSU to compare pollen samples from bees and flowers to discover which bees pollinate which flowers. They will present their results during a campus conference on May 18th 2006 to be attended by university /school administrators, parents, stakeholders, and the TAF President. This program has the added value of being part of a larger OSU research study on bee diversity. The pollination project will be used as a model for developing similar lessons on OSU research topics of local relevance such as invasive species, salmon, and non point source pollution in Oregon Rivers, for integrating OSU research with rural science education.

Program Extension-Regional: In rural schools a distance away from Corvallis, a Science Blitz, suggested by teachers in John Day, will be adopted. In each term, select OSU Fellows will initially spend 3 weeks in intense planning, then travel to remote schools and spend 3 weeks providing science instruction in as many classrooms as possible. Fellows will then proceed to another remote school and provide a similar Science Blitz. Lessons will cover the ecology of the school surroundings, such as the fossil beds in John Day and agroecosystems in Hermiston. Accommodation for the Fellows will be provided by the community.

Program Extension-National: In collaboration with a national NSF program, we will develop an interface for submission of K-12 curricular items developed by OSU Fellows to a National Science Digital Library that will enable us to align our lessons not only to Oregon standards but to national standards as well, thereby increasing their availability to teachers nationwide.

Program Expansion-International: We will partner with OSU's Corroborree 4-H Across the Sea Program, a web-based curriculum through which students in the U.S. and Australia participate in hands-on activities related to local habitats, and exchange results via the web. Corroborree will be implemented by OSU Fellows in the GK-12 program to provide rural students with a global perspective of the environment, and to build technology skills in teachers for program sustainability. It will also be expanded to include new partners in China and India.

Program Impacts: OSU Fellows will gain experiences in scientific communication and team work. Each Fellow will make a presentation on their experiences in a department seminar, and prepare a peer-reviewed manuscript. Rural students will gain unique opportunities to explore nature and make discoveries in their communities. The lessons will expose them not only to science, but to OSU as well. It will provide a diversity of role models (particularly women and minorities), enabling rural students to envision themselves as future college students, and scientists. The close interaction with OSU, strengthened by involving rural youth in university research, and visits to technological facilities on campus, will facilitate changes in stereotypic perceptions of scientists, alleviate fears about science, and motivate students to consider science careers. For teachers, a Professional Learning Community will be initiated to help alleviate their isolation, and to provide mentorship. Teachers will also participate in grant writing and action research workshops to be organized at OSU. For program sustainability at OSU, a Rural Science Education Fund has been established in CSS, and additional grants have been received / submitted. In addition, a new course on Science Education and Outreach is being offered.

Recruitment and Selection: Graduate students will be selected from science disciplines based on merit, enthusiasm, and performance in an interview. As per NSF specifications, no graduate student pursuing a degree in science education will be recruited, and Fellows will be supported for no more than 2 years. Preference will be given to underserved minority students and to those from rural communities. Using these criteria, in Track I we recruited 39 Fellows (18 graduate and 21 undergraduates) of which 2.5 % were Native American, 2.5 % African

American, 10 % Hispanic; 77 % Women). Teachers will be recruited in consultation with school administrators and review of applications. Criteria for selection will include: location, subjects taught, and willingness to mentor OSU Fellows and participate in campus activities.

Organization, Management and Institutional Commitment: The PI and co-PI will be responsible for overall management of the project, and accomplishment of program goals. Faculty resource members will attend the Special Topics course each term and work with OSU Fellows on development of activities pertaining to their areas of expertise. A Project Coordinator will be hired to coordinate OSU Fellows activities, and assist with the internal evaluation, reports, webpage, and longitudinal tracking of impacts on current and alumnus Fellows.

Annual OSU commitments include: 1) One GTA from the College of Agriculture, 2) \$ 20,000 from the Research Office to be used towards Project Coordinator's salary (part), 3) CSS and SMILE staff time for delivery of the Science Education and Outreach course, 4) CSS, SMILE and the School of Education staff time for OSU Fellow and teacher training, and 5) Faculty Advisor time (diverse departments) for mentoring OSU Fellows.

Evaluation: Formative and summative evaluation will incorporate a "mixed methods" approach for ensuring validity of findings through triangulation of data. Internal evaluation will include 'before' and 'after' science content quizzes to determine student impact. A "Draw-a-Scientist-Test", coded to determine if the students' include aspects of themselves or of the OSU Fellows, will be used to assess K-12 student perceptions of scientists. As in Track I, feedback from mid and end year evaluation workshops will be incorporated for program improvement. The external evaluation will include classroom observations, interviews, focus groups, and surveys administered each year in fall and again in spring to K-12 students, K-12 Teachers, current and alumni Fellows, and faculty advisors. Qualitative data will be coded for themes based on program objectives, and triangulated with quantitative data from the surveys. The external evaluator will provide interim reports for formative evaluation. Annual summative evaluation reports will summarize and interpret results, and provide recommendations.

List of Faculty Participants: The OSU faculty team will consist of faculty with diverse backgrounds from science and education related departments: S. Rao (Entomology); E. Jensen (Forest Resources); P. Hayes (Plant Breeding); E. Sulzman (Soil Ecosystems); M. Dragila (Hydrology); J. Noller (Soil Mapping); H. Stotz (Post Harvest Technology); S. DeBano (Terrestrial Ecology); D. Wooster (Aquatic Ecology); R. Halse (Botany); M. Dalton (Education); E. Davis-Butts (Education); S. Bottoms (Education); Ryan Collay (Education).

School District Involvement: School administrators will assist with: 1) proposal development and selection of teachers, 2) funding for substitute teachers when participating teachers attend program-related activities, 3) scheduling to enable participating teachers train other teachers in the schools for program sustainability, 4) organization of events to showcase OSU Fellows-rural students achievements in local communities, and 5) contacting their districts and local businesses to seek supplemental funding. In remote areas, teachers will provide accommodations for OSU Fellows implementing the Science Blitz.

Bridging Track I and the Renewal: Track I success was largely due to the strong OSU-rural school partnerships that were established between 2002-2005. These also enabled us to sustain the program at a reduced level in 2005-2006, without a break, and without NSF funding. OSU students continued to enrich rural science education through support from Toshiba, CAS, Honors DeLoach Scholarship, and the Science Education and Outreach course. For 2006-2007, a grant has been received from Wells Fargo and additional proposals have been / will be submitted to Autzen, Toshiba, OSU Extension, the OSU Rural Initiative, and other agencies.