CREAM Graduate Fellow Packet

Culturally-Relevant Engineering Applications in Mathematics (CREAM)

Washington State University

GRADUATE TEACHING FELLOWS IN K-12 EDUCATION (GK-12)
National Science Foundation

Graduate Fellow Information Packet

Contents

Project Personnel

Dr. Denny Davis, Engineering Education Research Center: (509-335-7993), davis@wsu.edu

Dr. Jerry Maring, Teaching and Learning: (509-335-5651), maring@wsu.edu

Dr. Sandy Cooper, Mathematics: (509-335-3134), sccooper@math.wsu.edu

Dr. Jennifer Beller, Assessment and Evaluation: (509-335-4907), jbeller@wsu.edu

Dr. Guy Westhoff, Teaching and Learning: (509-335-8845), westhoff@wsu.edu

Ms. Janae Landis, Mathematics Engineering Science Achievement (MESA) TriCities: (509-372-7194), j_landis@wsu.edu

Mr. Jorge Moreno, MESA Middle School Coordinator, TriCities: (509 372-7244), jomoreno_mesa@wsu.edu

Mr. John Doty, CREAM Graduate Research Assistant: (509-335-6407), john_doty@wsu.edu

Graduate Fellow Expectations and Benefits

The Culturally-Relevant Engineering Applications in Mathematics (CREAM) project provides graduate fellows opportunities to engage in classroom instruction where culturally-relevant engineering applications of mathematics are tools for enhancing student learning. CREAM fellows will be paired and assigned to a school where they work alongside one or more math teachers to develop, implement, and assess impacts of curriculum materials on student learning. The fellow appointments last a full year, beginning with summer training and continuing through the full academic year at the school site. Fellows will participate in a two weeks of workshops at WSU in July to develop a foundation in classroom teaching and instructional design for cultural relevance. One-week of this time will be spent with their assigned teacher to establish a common foundation for development and use of curriculum materials. Fellows are also expected to interact with others at other schools to share developments and learn from one another. They will travel between their school site and campus as needed to strengthen ties between the schools and WSU. Fellows are expected to help compile curricular materials and contribute to project assessment at the end of their year's assignment.

Participation in this fellowship may extend the length of your graduate program. However this is offset by a number of important benefits, especially for students with academic careers in mind. Typical benefits expected from participation as a CREAM graduate fellow include:

- Increased understanding of teaching, learning, and assessment
- Experiential learning about challenges and rewards of the teaching profession
- Increased understanding of cultural interests and issues affecting student learning
- Satisfaction in seeing students become energized to learn math
- Increased appreciation for engineering's role in society and in K12 education
- Lifelong friendships developed during the project
- Financial compensation of $30,000 per year
- Interactions with engineering education professionals locally and nationally
- Participation in engineering education research
- Opportunity to present research results at a professional meeting

NSF Graduate Teaching Fellows in K-12 Education (GK-12)

This program supports fellowships and associated training that enable graduate students in NSF-supported science, technology, engineering, and mathematics (STEM) disciplines to acquire additional skills that will broadly prepare them for professional and scientific careers in the 21st century. Through interactions with teachers in K-12 schools, graduate students can improve communication and teaching skills while enriching STEM instruction in K-12 schools. In addition, the GK-12 program provides institutions of higher education with an opportunity to make a permanent change in their graduate programs by including partnerships with K-12 schools in a manner that is of mutual benefit to their faculties and students**.** Expected outcomes include improved communication, teaching and team building skills **for the Fellows;** professional development opportunities **for K-12 teachers;** enriched learning **for K-12 students**; and strengthened partnerships **between institutions of higher education and local school districts**.

CREAM Graduate Fellow Information

Engineers and Mathematicians Applying Engineering in K-12 Schools

Washington State University offers engineering and mathematics graduate students a rewarding opportunity to bring practical applications to high school and middle school math classes. Beginning fall 2006, a three-year National Science Foundation project, "Culturally-Relevant Engineering Applications in Mathematics (CREAM)," will place eight CREAM Graduate Fellows in four Washington schools to assist teachers teaching engineering applications of math. Tri-Cities MESA (Mathematics, Engineering, Science, Achievement) will collaborate to enhance cultural relevance of materials in Pasco schools.

Fellows and teachers will participate in a summer institute to prepare for joint instructional responsibilities. Graduate Fellows will develop curricular materials, implement them in classrooms, and help assess impacts on student learning. Fellows and teachers will share ideas, materials, and insights through regular videoconferencing among schools. Two additional graduate research assistants will provide support for curriculum development and for project assessment.

Benefits

- Fellows learn instructional methods, explore teaching careers, gain cultural understanding, and find satisfaction in student success. Fellows also receive a $30,000 stipend for a 12-month commitment along with support for tuition and travel to professional meetings.
- Teachers gain new instructional materials, network for instructional support, and learn about engineering careers. Teachers also receive a $4,500 annual stipend for participation in the project and attending the summer institute.
- Students profit from culturally-relevant instruction, learn more from motivated participation, learn about engineering careers, and meet engineering role models.

Qualifications

Applicants for CREAM Graduate Fellow positions must be:

- **US Citizens or permanent residents** enrolled in a graduate degree program at WSU in engineering, mathematics, or math education with engineering baccalaureate
- Motivated toward careers with a teaching responsibility
- Willing to live in the community of the school [Pullman, Pasco, Omak or Grand Coulee Dam schools] in which they partner with classroom teachers (See school district profiles for more information.)
- Willing to participate in Fellow assessments associated with the project (e.g., impacts on their cultural understanding, interest in teaching, confidence in teaching)
- Willing to submit to a background check mandatory for classroom teachers

Application

Individuals interested in CREAM Graduate Fellow positions must submit a completed application (see attached) by February 20, 2007.

For More Information

Attend an information session: Wednesday, January 31, 2007 at 4 pm in room 119 of the Engineering Teaching and Research Laboratory on the WSU Pullman campus.

Or contact Dr. Denny Davis (509-335-7993), davis@wsu.edu; Dr. Jerry Maring (509-335-5651), maring@wsu.edu; Dr. Sandy Cooper (509-335-3134), scooper@math.wsu.edu; Dr. Jennifer Beller (509-335-4907), jbeller@wsu.edu or Dr. Guy Westhoff (509-335-8845), westhoff@wsu.edu.

CREAM Graduate Fellow Application

Washington State University

Personal Information

Name: _____ Date: _____

Mailing Address: _____

Phone: _____ Email: _____

Citizenship: _____ Residency: _____

Expected Degree Program: _____ Graduate Advisor: _____

Degree Start Date: _____ Degree Finish Date: _____

Educational Background

Degree	Discipline	Institution	Year

Work Experience (most recent)

Year	Job Title	Employer	Location

References

Name	Title/Relationship	Phone	Email

Interest in Schools for Placement: (N = none, L = low, M = moderate, H = High)

Pullman: _____ Pasco: _____ Omak: _____ Grand Coulee Dam: _____

Statement of Interest

Prepare a 1-page statement of your interest in the CREAM Graduate Fellow position. Describe how it contributes to your career and life goals. Identify unique strengths and perspectives you bring to the position that give evidence of your potential to succeed in this project. State your willingness to live in the community of your teaching assignment, participate in assessments of the project, and submit to a background check mandatory for K-12 teachers.

Return this completed application by 5 pm on **February 20, 2007** to: Dr. Denny Davis, 143 Dana Hall, PO Box 642714, Pullman, WA 99164-2714. Or email to: davis@wsu.edu.

Graduate Student Informed Consent Form

WASHINGTON STATE UNIVERSITY

Culturally Relevant Engineering Applications in Mathematics

Researchers: Denny Davis, Ph.D. (Engineering Education Research Center—509-335-7993), Gerald Maring, Ph.D. (College of Education—509-335-5651), Sandra Cooper, Ph.D. (Dept of Mathematics – 509-335-3134), & Jennifer Beller, Ph.D. (College of Education – 509-335-4907)

Researchers' Statement

We are asking you to participate in a research study. The purpose of this consent form is to give you the information you will need to help you decide whether to be in the study or not. Please read the form carefully. You may ask questions about the purpose of the research, what we would ask you to do, the possible risks and benefits, your rights as a participant, and anything else about the research or this form that is not clear. When we have answered all your questions, you can decide if you want to give permission to participate in the study or not. This process is called 'informed consent.' We will give you a copy of this form for your records.

PURPOSE AND BENEFITS

This project uses culturally-relevant engineering applications in mathematics (CREAM) to energize graduate students, K-12 teachers and students, and university faculty to reform mathematics education and heighten engineering career aspirations. Teachers with graduate student mentors facilitate educationally sound, student-centered, engineering projects in which High School students create engineering solutions to local socially-important problems while achieving classroom objectives and state mathematics standards. Diverse and distant students and teachers connected by video-conferencing technology form learning communities to improve teaching, learning, and understanding of engineering.

PROCEDURES

Your participation will involve work with classroom teachers and their students to help them learn problem solving techniques using basic math and engineering techniques over a school year. You will complete a math and engineering attitude survey at the beginning of the year and the end. You can refuse to participate at anytime and may refuse to answer some or all of the survey questions without reprisal. The results of the research study may be published but your name or identity will not be revealed.

____ I give permission to be audiotaped in group discussions.

RISKS, STRESS, OR DISCOMFORT

The research in which you will be participating does not involve more than the foreseeable risks involved in the day-to-day teaching and learning environment of a high school classroom.

OTHER INFORMATION

Data from your participation will remain confidential in a locked cabinet at the WSU Engineering Education Research Center. The PI and Co-PIs will have access to this information for research purposes and that data may be published without any identifiers to you.

Graduate student fellows will be compensated with a stipend.

_____

Printed name of researcher Signature of researcher Date

Graduate fellow's statement

This study has been explained to me. I volunteer to participate in this research. I have had a chance to ask questions. If I have general questions about the research, I can ask one of the researchers listed above. If I have questions regarding my rights as a participant, I can call the WSU Institutional Review Board at (509)335-9661. This project has been reviewed and approved for human participation by the WSU IRB. I will receive a copy of this consent form.

_____

Printed name of subject Signature of subject Date

School District Profiles

FOR

CULTURALLY-RELEVANT ENGINEERING APPLICATIONS IN MATHEMATICS (CREAM)

The four school districts invited to participate in CREAM are Grand Coulee Dam School District, Omak School District, Pasco School District, and Pullman School District. Below is a snap-shot of each district, the community it serves, and some of the school priorities that relate directly to CREAM.

Grand Coulee Dam School District

Grand Coulee Dam School District is a rural school district located in the town of Grand Coulee Dam in Northeast Washington State. The dominant feature in the town is Grand Coulee Dam, which was constructed from 1933-1941 with the triple objective of providing hydroelectricity to the Pacific Northwest, irrigation to Columbia River basin farmland, and flood control to the river basin. It is the largest concrete structure in the United States and the third largest hydroelectric facility in the world. A lesser-known fact is that the dam waters flooded many falls that were traditional fishing grounds for the Indian tribes whose ancestral lands made up a large part of North Central and North Eastern Washington. Fishing was a critical piece of the fabric of the lives of these Indian peoples and, with the construction of the dam, their traditional way of life was permanently disrupted. A legal arrangement, promising regular revenue to the Colville Confederated Tribes to compensate for this loss of livelihood and land, was signed before the construction of the dam, but was not honored. In the last few years, legal battles have resulted in some compensation, but much less than was originally agreed upon.

Grand Coulee Dam School District is located on the boundary of the Colville Reservation. The district has one elementary school, one middle school, two high schools including the main high school, Lake Roosevelt High School (LRHS), and an alternative high school, Skilskin High School. LRHS is the receiving school for Nespelem School, which is a K-8 school on the reservation. The tables below give a summary of the LRHS student demographics and teacher information as reported by the Washington State Office of Superintendent of Public Instruction (Tables 1 and 2).

The study body is approximately 52% Native American, 44% White, and the remaining 4% are divided among Hispanic, Black, and Asian or Pacific Islander. Also, 9.9% of the students are classified as Special Education students, 33% are eligible for free or reduced lunches, and the estimated cohort graduation rate is 77%.

The teacher statistics show that 58% of the teachers have a masters degree or above, and the average years of teaching experience is 18.6.

Lake Roosevelt High School has experienced a high turnover in administration (three new principals and three new superintendents) in the last six years contributing to a certain amount of disarray.

Table 1. Lake Roosevelt High School Student Demographics

October 2005 Student Count	278
Gender (October 2005)	
Male	49.6%
Female	50.4%
Ethnicity (October 2005)	
American Indian or Alaska Native	52.2%
Asian or Pacific Islander	1.1%
Black	1.1%
Hispanic	1.8%
White	43.9%
Special Programs	
Free or Reduced-Price Meals (May 2006)	32.7%
Special Education (May 2006)	9.9%
Transitional Bilingual (May 2006)	0.0%
Migrant (May 2006)	0.0%
Other Information	
Annual Dropout Rate (2004-05)	5.2%
Estimated Cohort Graduation Rate (2004-05)	77.0%

Source: Washington State Report card published by the Office of Superintendent of Public Instruction, /http://reportcard.ospi.k12.wa.us

Table 2. Lake Roosevelt High School Teacher Statistics (2005-06)

Classroom Teachers	19
Average Years of Teacher Experience	14.6
Teachers with at least a Master's degree	57.9%
Total number of teachers who teach core academic classes	16
% of teachers teaching with an emergency certificate	0.0%
% of teachers teaching with a conditional certificate	0.0%
Total number of core academic classes	84
% of classes taught by teachers meeting the federal definition of highly qualified	100.0%

Source: Washington State Report card published by the Office of Superintendent of Public Instruction, /http://reportcard.ospi.k12.wa.us

Increasing WASL scores and student engagement and success are primary objectives of this school district, especially in mathematics and science. The 2004-05 WASL data included a 36.6% pass rate for the mathematics portion and 16.9% pass rate for the science portion. The science and mathematics teachers, in conjunction with the curriculum coordinator, are actively pursuing strategies to increase student engagement and success in these subject areas with the objective of improving WASL scores and better preparing their students for post-secondary education.

Omak School District

Omak is located off the southwest edge of the Colville reservation. This is home of the annual Omak Stampede and Suicide Race, a five day celebration held each August featuring, among other events, the nationally renowned Suicide Race that takes the riders and horses down an incredibly steep slope, across a shallow river, and into the Omak city park and playfields. It is a thrilling race, but not without risk to horses and riders.

Omak School District has two elementary schools, one middle school, two high schools including the main high school and an alternative high school, and Pascal Sherman Indian School, a residential school on the Colville reservation serving pre-kindergarten through 9th grade Native students. The tables below give a summary of the student demographics and teacher information as reported by the Washington State Office of the Superintendent of Public Instruction (Tables 3 and 4).

Table 3. Omak High School Student Demographics

October 2005 Student Count	499
Gender (October 2005)	
Male	56.7%
Female	43.3%
Ethnicity (October 2005)	
American Indian or Alaska Native	30.7%
Asian or Pacific Islander	1.6%
Black	0.6%
Hispanic	7.2%
White	59.9%
Special Programs	
Free or Reduced-Price Meals (May 2006)	36.8%
Special Education (May 2006)	11.0%
Transitional Bilingual (May 2006)	1.1%
Migrant (May 2006)	1.3%
Other Information	
Annual Dropout Rate (2004-05)	1.9%
Estimated Cohort Graduation Rate (2004-05)	91.50%

Source: Washington State Report card published by the Office of Superintendent of Public Instruction, /http://reportcard.ospi.k12.wa.us

Table 4. Omak High School Teacher Statistics (2005-06)

Classroom Teachers	36
Average Years of Teacher Experience	16.0
Teachers with at least a Master's degree	51.4%
Total number of teachers who teach core academic classes	20
% of teachers teaching with an emergency certificate	0.0%
% of teachers teaching with a conditional certificate	0.0%
Total number of core academic classes	93
% of classes taught by teachers meeting the federal definition of highly qualified	100.0%

Source: Washington State Report card published by the Office of Superintendent of Public Instruction, /http://reportcard.ospi.k12.wa.us

Approximately 31% of the Omak students are Native, 7% are Hispanic, 60% are White, 2% are Asian or Pacific Islander, and there are a small number of Black students. Omak has 11% of their students designated as Special Education, 37% of the students qualify for free or reduced lunches, and the estimated cohort graduation rate is 91.5%.

The Omak faculty is fairly senior with the average years of teaching experience equal to over 18 years. Melody Pecha, one of the mathematics teachers, recently became National Board Certificated. Certification involves a lengthy, rigorous process that serves to enhance the effectiveness of the best teachers and validates their commitment and expertise. Only 581 teachers (1%) in the State of Washington have earned this recognition.

Current priorities for the Omak School District include teacher collaboration, making the curriculum relevant to students in order to engage their interest, and increasing WASL scores.

Pasco School District

Pasco School District serves one of the fastest growing communities in Eastern Washington and is the educational home to over 11,000 students from the City of Pasco and Franklin County. It has eleven elementary schools, three middle schools, one high school and an alternative secondary school. About 73% of Pasco's students are minority including Asian or Pacific Islander (1.3%), African American (2.8%), American Indian or Alaskan Native (0.5%) and Hispanic (68%). Approximately 71% of all students come from low income households and about 4,800 are learning English as their second language.

The tables below give a summary of the student demographics and teacher information for Pasco Senior High School as reported by the Washington State Office of the Superintendent of Public Instruction (Tables 5 and 6).

Table 5. Steven's Middle School Student Demographics

October 2005 Student Count	776
Gender (October 2005)	
Male	51.4%
Female	48.6%
Ethnicity (October 2005)	
American Indian or Alaska Native	0.8%
Asian or Pacific Islander	0.3%
Black	2.8%
Hispanic	87.1%
White	9.0%
Special Programs	
Free or Reduced-Price Meals (May 2006)	89.09%
Special Education (May 2006)	10.9%
Transitional Bilingual (May 2006)	40.7%
Migrant (May 2006)	24.8%

Source: Washington State Report card published by the Office of Superintendent of Public Instruction, /http://reportcard.ospi.k12.wa.us

The average years of teaching experience for Steven's Middle School teachers is fairly low at 9.3 years; however over 68% have a master's degree or above.

Table 6. Steven's Middle School Teacher Statistics (2005-06)

Classroom Teachers	48
Average Years of Teacher Experience	9.3
Teachers with at least a Master's degree	68.8%

Source: Washington State Report card published by the Office of Superintendent of Public Instruction, /http://reportcard.ospi.k12.wa.us

Two district initiatives that are addressed by this project are to improve secondary math scores on the Washington Assessment of Student Learning and to involve more underrepresented students in mathematics and science classes.

Pullman School District

Pullman is a small, rural university town located in the rolling hills of the Palouse region in eastern Washington. Most of the residents are affiliated with Washington State University or are involved in farming. Wheat, peas, and lentils are the primary crops grown on the Palouse.

Pullman School District has three elementary schools, one middle school, and two high schools including the main high school and an alternative high school. The tables below give a summary of the student demographics and teacher information as reported by the Washington State Office of the Superintendent of Public Instruction (Tables 7 and 8).

Approximately 82% of the Pullman high school students are White, 1% are American Indian or Alaska Native, 10% are Asian or Pacific Islander, 4% are Black, and 4% are Hispanic. The percentage of students designated as Special Education is 8%, 23% qualify for free or reduced lunches, and the estimated cohort graduation rate is 84%.

Table 7. Pullman High School Student Demographics

October 2005 Student Count	721
Gender (October 2005)	
Male	53.1%
Female	46.9%
Ethnicity (October 2005)	
American Indian or Alaska Native	1.1%
Asian or Pacific Islander	10.0%
Black	3.5%
Hispanic	3.3%
White	82.1%
Special Programs	
Free or Reduced-Price Meals (May 2006)	23.2%
Special Education (May 2006)	8.19%
Transitional Bilingual (May 2006)	1.1%
Migrant (May 2006)	0.0%
Other Information	
Annual Dropout Rate (2004-05)	3.6%
Estimated Cohort Graduation Rate (2004-05)	84%

Source: Washington State Report card published by the Office of Superintendent of Public Instruction, /http://reportcard.ospi.k12.wa.us

The average years of teaching experience for Pullman High School teachers is 13 years, however 69% have a master's degree or above. Pullman High School has also had a fairly high rate of turnover in administration over the past six years with three principals and two vice principals.

Table 8. Pullman High School Teacher Statistics (2004-05)

Classroom Teachers	45
Average Years of Teacher Experience	13.4
Teachers with at least a Master's degree	68.9%
Total number of teachers who teach core academic classes	32
% of teachers teaching with an emergency certificate	0.0%
% of teachers teaching with a conditional certificate	0.0%
Total number of core academic classes	129
% of classes taught by teachers meeting the federal definition of highly qualified	98.5%

Source: Washington State Report card published by the Office of Superintendent of Public Instruction, /http://reportcard.ospi.k12.wa.us

The Pullman High School teachers have found greater success for students when they can tie the mathematics they are learning to specific applications. The teachers are constantly looking for more rich and meaningful applications to weave into their curriculum and are eager to work with CREAM fellows on this project.