

# Community Colleges of Spokane FOUNDATION

## Welty Systemic Program and Professional Development Grants Funding Request Cover Sheet

Please be sure to read the front page of this application for complete details of requirements and procedures.

1. Deadline: February 29, 2016

2. Please submit one original and 5 copies, including this cover sheet.

3. Please limit complete application, attachments and supporting documents to 10 pages (including this cover sheet).

4. Please review application requirements and procedures carefully so as to include all required documentation.

Name of Project: Undergraduate Research Program

Brief Description of Project: To research and establish a set of best practices, including faculty training, student involvement, and equipment procurement, for implementing a sustainable Undergraduate Research (UR) Program at SCC. The UR program will provide an opportunity for students to be mentored under the guidance of our faculty in research projects that will aid their pursuit of STEM degrees and careers.

Amount Requested: \$50,000

Contact Name: Methea Sapp

Contact Mail Stop: 2070 Phone: 533-7235

Applicant Signature

Signature *Methea Sapp* Date 2/25/16

College President Signature

Signature *Dennis Ryan Carter* Date 2.26.16

Comments: \_\_\_\_\_  
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### **1. Project Name – Undergraduate Research (UR) Program**

**Goal:** To research and establish a set of best practices, including faculty training, student involvement, and equipment procurement, for implementing a sustainable Undergraduate Research (UR) Program at SCC. The UR program will provide an opportunity for students to be mentored under the guidance of our faculty in research projects that will aid in their pursuit of STEM careers.

**2. Support of Strategic Priorities:** An undergraduate research program at SCC would support all of the CCS strategic priorities. Assessment of undergraduate research (UR) programs at both two-year and four-year institutions consistently cite increased **student success** and retention as primary outcomes for students who participate in UR (Fechheimer et. al., 2011; Gregerman, 1999; Locks & Gregerman, 1999; Lopatto, 2007). Undergraduate research programs are by definition and in practice, forms of **innovation** which demand constant **communication** and **collaboration** between students, faculty and local and regional STEM partnerships. Additionally an UR program would reinforce all of SCC's Core Themes, along with a number of its Core Values, by improving upon science, technology, engineering and mathematics (STEM) **workforce development and community partnerships**, improving **student success** and retention, and aiding **academic transfer** (Lopatto, 2007).

### **3. Grant Team (in alphabetical order)**

**Suzanne Bassett**, Co-Principal Investigator, Spokane Community College

Suzanne Bassett teaches life sciences classes, including Microbiology, General Biology and Scientific Investigations at Spokane Community College. She has taught for almost 13 years. Prior to her position at SCC, Suzanne was employed as a teaching assistant at the University of Texas Health Science Center in San Antonio, TX where she earned her Ph.D. in Microbiology and Immunology. She also served as a postdoctoral fellow and Lab Manager at the University of Texas Medical Branch in Galveston, TX. She is a contributing author on peer-reviewed publications and scientific presentations on hepatitis C virus and phosphorothioate aptamer research. Suzanne also held a sabbatical appointment for pertussis research at the University of California, Los Angeles Department of Microbiology, Immunology & Molecular Genetics, David Geffen School of Medicine at UCLA with Dr. Jeffery Miller in 2013. She continues to collaborate with Dr. Miller on research projects that are shared with SCC students. Suzanne enriches her biology and microbiology classroom laboratories with components of these authentic research projects. She also works with students outside of the classroom and is the current advisor of the Research Club at SCC. Suzanne was the Co-PI of Biotechnology Education Infusion, an Advanced Technological Education grant, a collaborative project between Washington State University, Eastern Washington University and Spokane Community College. Biotechnology training and experiences were offered to high school science teachers, students and school counselors to encourage biotechnology career pathways. Suzanne has been awarded 5 Community Colleges of Spokane Foundation Mini-Grants for sharing authentic research experiences with SCC students. This research involves molecular biology and bacterial genetics techniques to study *Bordetella bronchiseptica*, a causative agent of kennel cough, and a safer model system for whooping cough research.

**Erin Griffin**, Co-Principal Investigator, Spokane Community College

Erin is a life sciences instructor in the Science Department at Spokane Community College (SCC). She teaches Cell and Molecular Biology, Microbiology, and General Biology. Erin has extensive experience mentoring undergraduate research. Prior to her employment at SCC, she was a research associate at the Biosensors and Nanotechnology Applications Laboratory. There, she served as a mentor for National Institutes of Health Biomedical Research Infrastructure Network (NIH-BRIN) undergraduate research fellows. When Erin transitioned to SCC in 2007, she organized and outfitted a dedicated research laboratory in the Livingston Science and Mathematics Building. In 2012, she was awarded two CCS Foundation Mini-Grants, "Undergraduate Research at SCC" and "Enhancing the Learning Experience: Genetics" that facilitated additional hands-on learning experiences for students. Erin founded the SCC Research Club (RC) and served as its advisor from 2012-2015. During this time, she and the RC members were awarded several CCS Foundation Mini-Grants to support research. Erin mentored the students, managed the grant expenditures, and the student researchers presented their findings at the annual Spokane Intercollegiate Research Conference (SIRC) at Gonzaga and Whitworth. Erin holds a BS in Biology and an MS in Microbiology, Molecular Biology, and Biochemistry from the University of Idaho. She is a student advocate who is continually seeking new methods and collaborations to improve her pedagogy, student learning and retention. Erin currently serves on the SCC Curriculum Committee, and she has served on the Life Sciences Curriculum Task Force, the Arts and Sciences Grants and Special Projects Committee, the Quarter-to-Semester Task Force, the Student Success and Curriculum Task Force, and the district-wide Committee for Science Olympiad. She has been a member of the American Society for Microbiology (ASM) since 2003, the National Education Association (NEA) since 2007, and she secured institutional membership for CCS in the Council on Undergraduate Research (CUR) in 2013.

**Karen Porter**, Co-Principal Investigator, Spokane Community College

Karen is a life sciences instructor at Spokane Community College and teaches general Biology and Anatomy and Physiology. Karen and Andy Schmidt (CoPI) have been awarded with a SCC Foundation Grant for the 2015 and 2016 academic years for training students on the art of tissue histology. Under these grants, students are trained in various histological techniques and this training will be a foundation for an independent project of the student's choosing. Prior to her employment at SCC, Karen served as a postdoctoral fellow at Washington State University, Spokane and University of Minnesota where she had experience planning and implementing research projects as well as training numerous undergraduate students on various laboratory techniques. She has mentored students from the Nutrition and Exercise Physiology Undergraduate Research Fellowship at WSU which is a program that provides students an opportunity to complete a small research project over the summer and present their findings at a research symposium. Karen has a BA in Environmental, Population, and Organism Biology from the University of Colorado, Boulder and a PhD in the Interdisciplinary Program in the Biomedical Sciences: Physiology and Pharmacology Concentration from the University of Florida. Her main interests include cardioneurophysiology involved with stress and exercise.

**Methea Sapp**, Co-Principal Investigator, Spokane Community College

Methea has been teaching life-science courses at SCC for the past 10 years. She teaches a range classes and laboratories including Human Anatomy and Physiology, Environmental Biology, Cellular Biology, Introductory Biology and Marine Biology. Her area of expertise is in Ecology with special interests in species diversity and marine plastics. She is currently the PI on a long-term study of marine debris accumulations in the Sea of Cortez. Prior to accepting a position with SCC Methea worked in a Classified research position with the Department of Defense. She has also lent her expertise to several coral reef studies, and conducted a series of marine mammal surveys while at sea with NOAA. Methea frequently writes and reviews materials for Oak Ridge National Laboratories and has published a book on the ecology of the Pacific and Western United States. She currently serves on SCC's Student Learning and Assessment Committee and is an active member of the Xerces Society, the American Association for the Advancement of Science (AAAS), and the National Marine Educators Association. Methea holds a BS from Loyola Marymount University and an MS in Zoology from Oregon State University.

**Andy Schmidt**, Co-Principal Investigator, Spokane Community College

Andy Schmidt is a Life-Science instructor at Spokane Community College. He has taught Introductory Biology, Organismal Physiology, and Human Anatomy and Physiology I and II courses. At SCC, he has served as the Science Department Tutoring Director and/or Liaison for 5 years. Additionally, Andy (and co-PI Dr. Karen Porter) have been awarded 2 SCC Foundation Mini Grants for the development of histology based undergraduate research at SCC where they have supervised several undergraduates. Prior to being an instructor at SCC, Andy was employed as an associate professor/post-doctoral fellow at the University of Pennsylvania School of Veterinary Medicine, where he performed research on the roles of various growth factors on the fate of mammalian spermatogonial stem cells. During his graduate and postdoctoral work, Andy supervised numerous undergraduate, graduate and post-graduate research projects. Andy is proficient at various laboratory techniques including cell culture, PCR, histology, immunofluorescence, immunohistochemistry and animal surgery. Additionally, Andy is a member of the Washington State University & University of Idaho Center for Reproductive Biology, an interinstitutional program involving over 80 faculty in 30 departments across 9 institutions and arguably one of the largest reproductive biology centers in the world. Andy holds a PhD and MS in Animal Science from Washington State University and is a contributing author on more than a dozen scientific presentations and peer-reviewed publications.

**Specific Aim 1: Assess the interests, needs and requirements of the science department faculty and students for the development of an undergraduate research (UR) program**

**Year 1:**

**A.** Implement a survey establishing the department's vision of an undergraduate research (UR) program. The survey will establish if faculty are interested in mentoring research students, what their needs are in terms of lab space and equipment to conduct their research, and if schedule alterations (reduced teaching and/or administration responsibilities) would encourage faculty to

participate in this type of program (Wayment 2008). The results of the survey will then be discussed at an open forum with the faculty of the department to establish the specific needs for training on specific laboratory and field techniques, and the necessary equipment and supplies required for data collection and analyses.

**B.** Conduct a survey in the Biology 220 series (BIOL& 221, 222, 223) and other science courses to determine student interest in undergraduate research. This survey would also assess the needs of the students in regard to degree completion and financial difficulties when pursuing undergraduate research projects. The survey would determine if students would benefit from incentives such as reduced tuition, scholarship opportunities, and/or college credit if they pursued independent research projects outside of their current class load.

**C.** Commit interviews with local institutions to assess how UR programs are coordinated and/or invite a consultant from the Council on Undergraduate Research (CUR) to provide assistance on how our institution can develop our own UR program. Faculty who are interested in advising UR will have the opportunity to receive formal training from CUR.

**D.** Assess current laboratory space and equipment. Our department has been granted an adequate lab space to conduct UR. We have several crucial pieces of equipment to assist in teaching undergraduate students including PCR machines, gel electrophoresis equipment, a microtome, imagers, microscopes, and cell culture hoods. By taking inventory of our current equipment, we can determine what additional pieces of equipment are required by the faculty for future research needs.

**Year 2:**

Once needs are determined, provide faculty with training via CUR, regional universities and colleges with specialized core facilities, and/or representatives from companies from which specific equipment will be purchased.

**Year 3:**

Design and implement a survey that evaluates the success and failure of the program and how to resolve issues that have arisen in regards to faculty training and need for equipment and supplies. The assessment for student success (Aim 3) will also be utilized to help faculty understand the outcomes from the UR program. Once results from both faculty and student surveys have been evaluated, these results would be communicated via a presentation to the department, division, and/or college.

**Specific Aim 2: Provide faculty with professional development opportunities to enrich their current laboratory skills sets and to learn new techniques**

**Year 1:**

The results from Specific Aim 1A will establish the needs for specific laboratory training for faculty. Once needs are determined, Aim 2 is to provide members of the department with the appropriate professional development to enhance their research needs. This will be determined by an allocation of funds for travel and attendance at conferences and workshops. For receipt of funds, faculty members will be required to provide a document outlining how the training

supports UR along with a budget. The co-principal investigators for this project will deem if the training is appropriate and grant faculty funding for this training. The knowledge gained by the faculty member during their professional development will be shared with their fellow colleagues through a Canvas library for faculty use and/or a training workshop within the department.

**Years 2 & 3:** Continue allocation of funds for professional training as needed. Faculty must submit a report to the co-advisors to establish the success of their professional development.

**Specific Aim 3: Establish the best practice(s) for implementation of assessment tools designed to measure undergraduate research (UR) outcomes**

**Year 1:**

**A.** The department will establish a Canvas site to store and organize a virtual library of best practices documents, primary literature and assessment tools. This will allow the department to establish criteria that will provide data regarding the measurement of learning gains, personal gains, and understanding of STEM careers by the students who have completed the UR program. The faculty will also be able to upload documents and information regarding professional development workshops to the Canvas site for department access.

**B.** Conduct research regarding national surveys such as the Survey of Undergraduate Research Experiences (SURE) and Undergraduate-Research Student Self-Assessment (URSSA) to determine which survey would be the best for measuring the outcomes of the undergraduate research program (Hunter, 2008; Lopatto, 2007).

**Year 2:**

Implement the established tools for measuring student outcomes including the national survey and the established best practices from the Canvas site. Additionally, students may also be assessed by their ability to complete their project and present their research at a local, regional, or national meeting. The ability to communicate scientific findings in front of faculty and their peers measures the professional and academic aptitude of the student following the conclusion of a research project.

**Year 3:**

Evaluate the assessment tools chosen by the department to determine if they appropriately measured the success of the UR program.

**Specific Aim 4: Generate a pilot study with small undergraduate research (UR) projects to establish student interest**

**Year 1:**

**A.** Establish a calendar of events promoting scientific research and STEM opportunities with the intent of facilitating student recruitment for the pilot cohort. This calendar could potentially include a presentation cycle consisting of formal STEM related presentations, brown-bag discussions, poster sessions, Spokane Intercollegiate Research Conference (SIRC) and EWU conference attendance, and/or journal article club discussions. This objective will be continued annually through years 2 & 3.

**B.** Implementation of the student survey in Aim 1 will also assist in determining the best practices for recruiting students. These could involve direct solicitation from students in science courses such as the Biology 220 series and Biological Investigation (BIOL 270). The Biology

220 courses are currently implementing small independent research projects. Additionally, students in the Biology 270 course design and conduct authentic experiments while learning the fundamentals of scientific methods and experimental design. The students collect data, perform analyses, and use scientific writing to share their findings. This type of training would be an appropriate foundation for students interested in UR projects.

C. Through the discussion and survey implemented in Aim 1, determine which faculty members would like to initiate small research projects through the UR program. Each faculty member would prepare and plan a project that would be implemented and assessed through the guidance of the co-advisors of this UR program.

### **Year 2:**

Faculty members initiating the pilot UR projects would recruit a small group of students to conduct small research projects. If projects come to completion, students must present at a conference and/or local poster session. Faculty will assess the feasibility of maintaining future research projects and whether or not equipment needs have been met. This will ensure the students' completion of, or progression through, their projects. The students will be expected to present their findings at the annual presentation cycle at SCC. Additionally, the student outcomes will be measured with established tools from Specific Aim 3.

In terms of sustainability, some faculty members may not participate in the UR program long-term if the research they pursue is not their true passion, or if they decide that the extra time required to help students outside of class is not feasible. Additionally, students may be enthusiastic about UR, but may not have the time to spend on research outside of class nor the financial means to enroll in extra research classes. Many of our students work full time, care for a family and take as many classes as possible in order to finish their degree as expediently as possible. A solution to these potential problems may involve implementing small authentic research projects that enhance the curriculum into the classroom laboratories of the courses we typically offer. We will research various classroom research projects that have been established by other institutions and survey student and faculty interest. The chosen projects will also be piloted in selected classes and assessments will determine their effectiveness.

**Year 3:** Continue research projects from the previous year with the same cohort of students to determine if their dedication will assist in the sustainability of an UR program. If projects come to completion, students must present at a conference and/or local poster session. Faculty will assess the feasibility of maintaining future research projects and whether or not equipment needs have been met to ensure the student's' completion of (or progression through) their projects. The students will be expected to present their findings at the annual presentation cycle at SCC. Additionally, the student outcomes will be measured with established tools from Specific Aim 3.

### **Specific Aim 5: Establish relationships for research collaborations within the Community Colleges of Spokane (CCS) as well as regional, national and/or international institutions**

**Year 1:** Conduct interviews with local institutions that have established UR programs in order to determine how best to facilitate an appropriate foundation for inquiry-based research at SCC.

**Years 2 & 3:** Collaborate with other CCS departments and local institutions to assist with UR projects. For example, interdepartmental collaboration with the Math department for statistical analyses or with the Environmental Sciences department for specific field measurements and analyses. Collaborations with local institutions might be through training or by initiating small projects where students can conduct the majority of their research at SCC, while the other institution provides them with equipment, cells, tissues, and any other assistance that is vital to the success and completion of the UR projects. These relationships could foster more intimate collaborations on UR projects across institutions. In addition to assisting with the support of SCC UR, these relationships will provide opportunities for more seamless transition for SCC transfer students as they move to larger institutions.

### References

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Gregerman S. Improving academic success of diverse students through undergraduate research. *Counc Undergrad Res Q.* 1999; 20:54-59.

Hunter A, Weston TJ, Laursen SL, & Thiry H. URSSA: Evaluating student gains from undergraduate research in the sciences. *Counc Undergrad Res Q* 2009; 29(3):15-18.

Locks A & Gregerman S. Undergraduate research as an institutionalized retention strategy: the University of Michigan Model in *Creating Effective Undergraduate Research Programs in Science: The Transformation from Student to Scientist*. New York: Teachers College Press 2008:11-32.

Lopatto D. Undergraduate research experiences support science career decisions and active learning. *Cell Biol Educ* 2007; 6:297-306.

Nagda BA, Gregerman S, Jonides J, von Hippel W, & Lerner J. Undergraduate student-faculty research partnerships affect student retention. *Rev High Educ*; 198; 22:55-72.

Osborn, JM & Karukstis KK. 2009. The Benefits of Undergraduate research, Scholarship, and Creative Activity in *Broadening Participation in Undergraduate Research: Fostering Excellence and Enhancing the Impact*. *Counc Undergrad Res*; 41-53.

Wayment HA & Dickson KL. Increasing student participation in undergraduate research benefits students, faculty and department. *Teaching of Psych* 2008, 35:194-197.

Wilson A. Using the National Survey of Student Engagement to measure undergraduate research participation. *Counc Undergrad Res Q*; 2012; 32(3):9-14.



Undergraduate Research (UR) Program - BUDGET -

Year 1 - Estimated Budget:

Item	Amount (\$)	Specific Aim	Description
Funding Faculty	9000	All Aims (1-5):	Time spent researching/developing/implementing surveys, faculty training (conferences, workshops), developing and implementing Canvas website and virtual library, scheduling (guest lecturers, presentation cycles, etc.), organizing the annual calendar of the aforementioned events, interviews/meetings/reviewing best practices (local colleges with established UR programs)
Travel Expenses (PI Prof. Dev.)	8250	Aims 1, 2	UR Program PIs attend conferences, workshops, and/or specific skills training
Council on Undergraduate Research (CUR) (Consulting)	3900	Aim 1	CUR Institutional Membership, CUR consulting expenses and assistance with UR program development and implementation
Conference and Workshop Registration Fees	4000	Aim 2	Specific laboratory training and professional development for faculty Co-Pis (conferences, workshops)
Equipment and Supplies/Consumables	1200	Aims 3, 4	Recruiting undergraduate researchers, media services (printing flyers etc.) Computer Software
<b>TOTAL (Year 1):</b>	<b>26350</b>		

Year 2 - Estimated Budget:

Item	Amount (\$)	Specific Aim	Description
Funding Faculty	7000	All Aims (1-5):	Faculty training time (CUR, regional universities or colleges, companies from which equipment has been purchased) Time spent at conferences, workshops, trainings, researching/comparing/selecting national UR Research outcomes surveys, scheduling (guest lecturers, presentation cycles, etc.), Canvas development, organizing the annual calendar of the aforementioned events, researching/developing surveys, mentoring student research projects, conferences, presentations, UR project collaborations -interdepartmental (SCC), regional and national institutions
Travel Expenses (PI Professional Development)	4200	Aims 1, 2	UR Program PIs attend conferences, workshops, and/or specific skills training
Council on Undergraduate Research (CUR)	900	Aim 1	CUR Institutional Membership
Conference and Workshop Registration Fees	2400	Aims 1, 2	Specific laboratory training and professional development for faculty (conferences, workshops)
Equipment and Supplies/Consumables	500	Aims 3, 4	Development and facilitation of PILOT student research projects -laboratory equipment and consumables 3-credit class: Scientific Investigation (BIOL 270) lab supplies, equipment, recruiting and advertising, media services (printing research presentation posters, recruitment tools/flyers etc.), computer Software and hardware for data analysis and data mining
<b>TOTAL (Year 2):</b>	<b>15000</b>		

Year 3 - Estimated Budget:

Item	Amount (\$)	Specific Aim	Description
Funding Faculty	6000	All Aims (1-5):	Time spent reviewing new assessment tools, developing/implementing program success assessment survey, identifying issues and steps to resolve them, organizing the annual calendar, recruiting undergraduate researchers UR project collaborations -interdepartmental (SCC), regional and national institutions
Travel Expenses	750	Aims 1, 2	Professional development: UR Program PIs attend conferences, workshops, and/or specific skills training
Council on Undergraduate Research (CUR)	900	Aim 1	CUR Institutional Membership
Conference Registration Fees	500	Aims 1, 2	Specific laboratory training and professional development for faculty (conferences, workshops)
Equipment and Supplies/Consumables	500	Aims 3, 4	Continuation of PILOT student research projects -laboratory equipment and consumables, 3-credit class: Scientific Investigation (BIOL 270) lab supplies, equipment, advertising, media, software, and hardware for the preparation/printing of student-designed UR presentations, computer software and hardware
<b>TOTAL (Year 3):</b>	<b>8650</b>		

**GRAND TOTAL: 50000**