RUI Impact Statement

The University of Wisconsin at Whitewater (UWW) is a mid-sized (~10,500 students) comprehensive university located in southern Wisconsin between Madison and Milwaukee. More than 60 majors are offered through four year colleges; master's degrees are offered in business and education. The campus also has a special mission serving the needs of disabled students and has one of the largest populations of such students in the country. As with virtually every comprehensive campus, the primary emphasis has historically been classroom teaching with hands on research training as a secondary priority. Recently, the university has acknowledged that “quality undergraduate education is best delivered by faculty who are both teachers and scholars within their fields of expertise.” The Institutional Strategic Planning and Budgeting Committee at UWW has declared as a goal the development of physical research facilities and recruitment of faculty who will improve active learning experiences, foremost of which is undergraduate research. As a concrete example of commitment to this goal, Upham Hall, the science building at UWW, underwent a $27 million renovation to upgrade all of the teaching, research, and animal care facilities used by our department. A number of large equipment purchases occurred with this renovation including a Real Time PCR machine, Scanning electron microscope, Confocal microscope, etc.

The campus has an active McNair Program with a mission of mentoring students in a number of underrepresented groups (minority students, women, first generation college students) in research. This provides a pool of underrepresented students with financial and institutional support. These students learn about opportunities for post graduate study and may aspire to go to graduate school. The campus actively supports student travel to regional and national meetings to present their work. UWW has sent 50-80 students to present their research at the National Conference for Undergraduate Research (NCUR) for the past 7 years. The university also sponsors Faculty Development grants, undergraduate research grants, and has a held an undergraduate research day the last 10 years for our students to present their work to their peers. Our campus hosted the 2002 National Conference for Undergraduate Research (NCUR) meeting and the North Central District II regional Beta Beta Beta Research conference in April, 2004.

Research at a predominantly undergraduate institution (PUI): The teaching load at UWW is high (between 12-14 contact hours per semester). Since there are no graduate students in biology at UWW, research is primarily carried out by faculty and undergraduate students. Many of these students are quite talented, and if they start on their projects early enough, they can accomplish a great deal in the lab. However, they do require substantial training to get started, so it is important to recruit them early in their academic careers. Having students in the lab for multiple years also allows the senior students to take over some of the mentoring of the new students. Where undergraduate research can be improved on our campus is for students to have the opportunity to continue their research over the summer while receiving a stipend. Many of our students need to work during the summer and during the school year for that matter to pay for their schooling.
The PI: Undergraduate students perform most of the research in my laboratory. Since starting at the University of Wisconsin at Whitewater (UWW) I have mentored 14 undergraduate students and two high school teachers. One of the reasons I accepted a position at the UWW is because of its commitment to undergraduate research. On campus we have an active undergraduate research program which consists of writing short research proposals. Students compete for intramural funding through these proposals and any student that receives an undergraduate research grant is automatically funded to go to NCUR in the spring. Locally we have an undergraduate research day that showcases research being done in all Colleges of the University (Letters and Sciences, Arts and Communication, Business, and Education). All the students in my laboratory have actively participated in this process. In fact, the Curran lab won first prize in the sciences poster competition at the UWW undergraduate research day three years in a row (2006-2008). I regularly have students submit grants to the βββ Biological Honors society and present their work at the Regional βββ meeting. The same three students mentioned above won the poster competition at the βββ regional meeting in years 2006-2008 as well. Also, we have one publication from UW-Whitewater (Curran, et al., 2008) that includes 4 undergraduate student authors (Jessica Solis, Aaron Trow, Brittany Bronson, and Nicole Sarver). Many of my students (but not all) have gone on to get jobs in science or to continue their education. For example, I have two students that are currently in Physician’s Assistant programs, one starting at the UW-Madison Veterinary School in the fall (2009), two working in industry (Invitrogen and Wicell), and one student who just graduated is planning on applying for graduate school for the 2010-2011 school year. I am beginning my sixth year at UWW in fall 2009 and will have four students working in the lab for the 2009-2010 academic year, which is the number I feel most comfortable mentoring. In addition, I participated in an NSF REU program during the summer of 2005 and 2006. I mentored one undergraduate (Brittany Bronson) and one high school science teacher (Karen Tiffany) in 2005 and one undergraduate (Jessica Solis) and one high school science teacher (Chris Cowan) in 2006. The experience that students receive in my laboratory often influences their decision to continue their education or to make them more competitive in the job market. Many of my students have come to the lab as academically high achievers who continued to excel in research. However, I also have mentored a number of students who were not particularly exceptional in the classroom. The research experience for these students can sometimes be more valuable than it is for the exceptional students. First, by doing research first hand, they often gain a greater understanding of basic scientific concepts, which often leads to improvement in their classroom performance. Second, these students can be quite talented in the laboratory and are often highly motivated. My criteria for accepting students in my lab are based on the student’s goals, motivation, and interest in research as well as aptitude.

Students working in the PI’s lab will participate in all aspects of research, including animal care, experimental design, drafting research proposals, submitting undergraduate research grants to the campus grant program and extramural grants to the βββ National biological honor society and presenting their data. Students will learn techniques associated with molecular biology including, plasmid preps, sub-cloning and building constructs, RNA extraction, reverse transcription, and Real Time PCR. Students will also learn basic embryological techniques and molecular genetic techniques used in Xenopus laevis. Students will collect and analyze data
and students that complete most of the manuscript writing will be first author on their research papers. If there are multiple student authors then authorship is based on significance of the student’s contribution to the research in terms of both bench work and intellectual effort (planning and interpreting experiments, writing and/or editing the manuscript).

Students are required to present their work as posters or oral presentations in at least two forums per year and are encouraged to compete with their peers for recognition of quality. Students are provided with critical literature in the field and discuss the significance of their work in the context of the existing literature in order to develop their critical thinking skills. With this strategy, I train students who are well prepared for graduate school, future health care providers who know how research is done, and technicians with skills that are highly valued in the job market.

The Department of Biological Sciences is part of the College of Letters and Sciences. Fourteen and half (split position with Chemistry) faculty members mentor about 475 undergraduate majors, as well as train biology minors, education majors and thousands of other students in non-major courses. The department has been a leader in promoting undergraduate research on this campus. Recent hiring has emphasized recruitment of faculty with significant research experience and a commitment to doing research with undergraduates. Throughout the past decade, the department has actively tried to alleviate the feeling of scientific isolation frequently felt at a PUI. At the same time, we emphasize the advantages of a PUI, including better opportunities for students to develop professional relationships with faculty mentors, better access to faculty, and the potential for a strong student support network.

Exposure of our students to different research areas is a primary goal. The UWW Department of Biological Sciences sponsors a weekly colloquium with a diverse group of research speakers. Several biology faculty have students, including the PI, develop open-ended research projects within majors’ courses (Introductory Biology I and II, Animal Behavior, Animal Physiology, Developmental Biology, Endocrinology, Planning and Presenting Biological Research). In an attempt to improve the quality and depth of the research experience for our students, the department has formalized an independent study course for undergraduate research students modeled after a laboratory meeting or journal club. Students meet on alternate weeks to present current literature or their own research results, and discuss their work with fellow students and faculty. This forum is used to expose students to published literature and encourage critical thinking. The faculty have also initiated a senior honors thesis specific to the department. At the end of the sixth year of this program, we had a total of 25 students successfully defend their theses. These experiences are invaluable in training the next generation of scientists and clinicians. It also provides a chance for renewal of faculty interest in current work. Our department has enjoyed increased monetary and institutional support for undergraduate research which has allowed our department to provide valuable research experiences to more of our students. In fact, we have recently completed an update to our curriculum which requires students to have one experiential learning experience (research, travel study, or internship) to obtain a biology degree. Unfortunately, in the near future budget cuts will be implemented on our campus and we do not know how this will affect the undergraduate research program at this time.
As a department, our faculty have facilitated and coordinated a number of research opportunities for students both in house and at other locations (Medical College of Wisconsin, Wisconsin Regional Primate Research Center, University of North Carolina, Mayo Clinic, Loyola University, George Washington University, etc.). Subsequently, students have presented talks and posters at meetings (NCUR, Beta Beta Beta Biological Honors Society regional and national meeting, regional and nation professional meetings) as well as coauthored manuscripts. The department has been able to provide research opportunities to between 15-25 undergraduates in each of the last 9 years. The PI has personally mentored 14 students over the last 5 years.

The Department also has received funding in the past for an NSF REU (Woller, PI: #0354140) for 2004-5 and similar program was run during the summers of 2006 and 2007 with support from UWW and 2008 with some extramural funding (non-NSF). This program brought together research teams composed of local high school teachers, undergraduates, and high school students into faculty research laboratories. The PI participated in this program in 2005 and 2006. This program was a great success but due to budget constraints is not being offered this summer (2009).

A number of Biological Sciences faculty have also worked to incorporate more research into the curriculum, so that all biology students learn the process of science. Again, NSF provided a major impetus for these efforts (McKinnon, PI: #0311609). Jeffrey McKinnon and colleagues received grant through the CCLI A &I program to adapt a series of exemplary model teaching systems for integration into 3-5 week semi independent research modules. These laboratory modules form the core of the new introductory laboratory sequences and each conclude with a group poster or presentation followed by individual write-ups. At the same time the research team overhauled the introductory biology lectures to make them more interactive and emphasize concepts and problem-solving. Evolution is receiving greater emphasis throughout the courses as the unifying theme.

More recently, our department in conjunction with other UW campuses and Beloit College has received support for the funding of minority students in research labs through the Wisconsin Alliance for Minority Participation (WiscAMP). This program provides students with a stipend during the school year to participate in research. This stipend hopefully alleviates the need of the student to work a job (many of these students must work or have families to support) and instead spend their time in the laboratory. The PI has participated in this program for the past three years and has mentored two students.