Wisconsin Louis Stokes Alliance for Minority Participation

WiscAMP
Wisconsin Alliance for Minority Participation

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Private Institutions
Alverno College
Beloit College
Lawrence University
Marquette University (2004-2009)
Milwaukee School of Engineering (2009-present)

Technical Colleges
Madison College
Milwaukee Area Technical College
Nicolet Community College

Tribal College
College of Menominee Nation

University of Wisconsin System Schools
UW-Eau Claire
UW-Green Bay
UW-La Crosse
UW-Madison
UW-Milwaukee
UW-Oshkosh
UW-Parkside
UW-Platteville
UW-River Falls
UW-Stevens Point
UW-Stout
UW-Superior
UW-Whitewater

University of Wisconsin System Colleges
Managed as one campus with 13 locations: Baraboo/Sauk County, Barron County, Fond du Lac, Fox Valley, Manitowoc, Marathon County, Marinette, Marshfield/Wood County, Richland, Rock County, Sheboygan, Washington County, and Waukesha

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Wisconsin Louis Stokes Alliance for Minority Participation (WiscAMP) Impact Report

The Wisconsin Louis Stokes Alliance for Minority Participation (WiscAMP) is a consortium of 22 public and private institutions across the state of Wisconsin with a shared goal of increasing the number of underrepresented minorities (URM) who receive bachelor degrees in science, technology, engineering, and math (STEM) disciplines. A second goal of the alliance, in aid of the first goal, is to create institutional transformation that can support and sustain diversity at all levels. WiscAMP has recently completed its seventh year of programming efforts. This report addresses the question: ***What impact has pursuit of these goals had on WiscAMP institutions and the URM students in STEM enrolled at the institutions?*** In order to provide a comprehensive response to this question, our impact report examines outcomes in two key areas:

- Increases in bachelor degrees awarded to and enrollments of underrepresented minority students in STEM disciplines
- Institutional transformation in terms of policies, practices and climate

In addition, these outcomes are explored in terms of the **economic benefit** to WiscAMP students and to WiscAMP institutions.

The report draws from the data and information provided to the National Science Foundation (NSF) in annual reports (2004-2011), the final, summative report for the first period of the WiscAMP project (2004-2009), and the evaluation materials provided annually to the national evaluator for the LSAMP program (2004-2010). Additional data are pulled from the NSF award search function on the NSF website, award searches at the Howard Hughes Medical Institute website, interviews with WiscAMP Small Grant Program principal investigators, Vice Provosts and Directors of Institutional Research at WiscAMP member institutions, and WiscAMP students. These data are presented within the context of state and national demographic trends pulled from the 2010 U.S. Census and the American Community Survey information about average salary and professions in Wisconsin.

WiscAMP Background and Project Significance

The impetus for developing an Alliance for Minority Participation (AMP) in Wisconsin came from two fronts. First, the United States faces a pressing need to invest in the STEM workforce in order to remain globally competitive (National Academies of Science, 2007). In particular, investment in the STEM workforce requires educational efforts that will broaden participation in STEM research and professional career pathways for groups that are underrepresented in STEM disciplines due to historically and culturally based biases linked to race/ethnicity, gender, and physical disabilities. In order to ensure the continued vitality of the STEM workforce in the

US, education and training of future scientists, engineers and researchers must accommodate the changing demographics of the country. US census data illustrate these changes. While people who identify as White alone are still a majority of the population as a whole, the growth rate for all other ethnic groups exceeds the growth rate of this majority.

The second factor impelling Wisconsin to form an AMP in 2004 concerns the relative rates of change in the demographics in the state. Based on 2000 census data the population of Wisconsin was 87 percent non-Hispanic White majority. However, the URM enrollment in Wisconsin's public schools was projected to double in less than 10 years (Winkler & Kemp, 2007). Results from the recent 2010 U.S. Census lend strong support to this prediction. Table 1 below shows the changes in population from 2000 to 2010 for the state of Wisconsin compared to the nation as a whole.

	Wisconsin		**U.S.A.**	
	Percent 2010	**Change 2000-2010**	**Percent 2010**	**Change 2000-2010**
White alone	86.2%	2.8% ⇧	72.4%	5.7% ⇧
Black or African American alone	6.3%	**18.0% ⇧**	12.6%	12.3% ⇧
American Indian & Alaska Native alone	1.0%	15.5% ⇧	0.9%	18.4% ⇧
Asian alone	2.3%	45.6% ⇧	4.8%	43.3% ⇧
Native Hawaiian and Other Pacific Islander alone	<0.5%	12.1% ⇧	0.2%	35.4% ⇧
Some Other Race alone	2.4%	60.1% ⇧	6.2%	24.4% ⇧
Two or More Races	1.8%	55.9% ⇧	2.9%	32.0% ⇧
Hispanic or Latino	5.9%	**74.2% ⇧**	16.3%	43.0% ⇧
Not Hispanic or Latino	94.1%	3.5% ⇧	83.7%	4.9% ⇧

Compared to the rest of the country, Wisconsin is a relatively homogenous state with a large White majority. However, the increases for Black or African American populations (18%) and the Hispanic or Latino populations (74%) exceed the growth rates for these populations nationally (12% and 43% respectively).

These data provide an important context for understanding the WiscAMP project in terms of the composition of the alliance, the programming approach used to accomplish the project goals of increasing URM students with STEM degrees and creating institutional transformation, and the enrollment and degree outcomes for URM students majoring in STEM. Each of these factors is explained in greater detail below and forms a basis for characterizing the impact of the WiscAMP project.

Composition of the Alliance

As noted above, WiscAMP is comprised of 22 institutions that cover all areas of the state. The large composition of the alliance relative to the small reflects the need to accommodate the distribution of minority communities in the state of Wisconsin who are underrepresented in the sciences and engineering. Inclusion of the broad network of UW-System campuses in

combination with two-year colleges and private institutions in the alliance allows WiscAMP to connect with underrepresented minority (URM) students in the sciences, engineering and math (STEM) disciplines in concentrated metropolitan areas as well as students who are living in much smaller communities in more rural areas of the state. The alliance formed in 2004 included:

- 13 four-year University of Wisconsin System schools (UW-Eau Claire, UW-Green Bay, UW-La Crosse, UW-Madison, UW-Milwaukee, UW-Oshkosh, UW-Parkside, UW-Platteville, UW-River Falls, UW-Stevens Point, UW-Stout, UW-Superior and UW-Whitewater)

- 4 private colleges/universities (Alverno College, Beloit College, Lawrence University, and Marquette University)

- 3 technical colleges (Madison Area Technical College, Milwaukee Area Technical College, Nicolet Area Technical College)

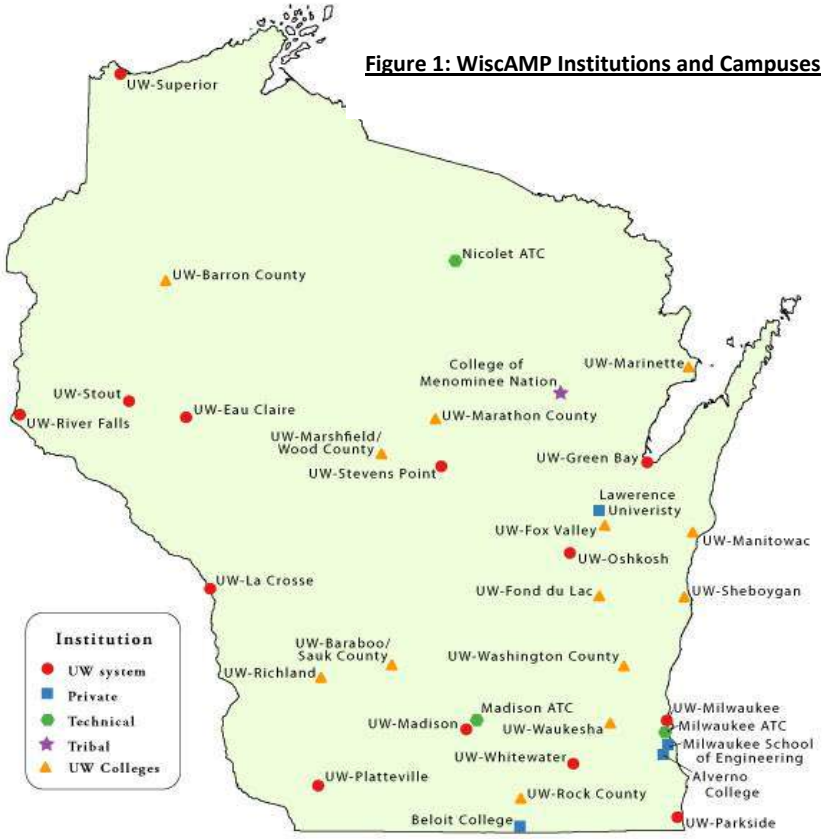
- 1 tribal college (College of the Menominee Nation)

With the successful renewal of the WiscAMP project in August 2009, WiscAMP member institutions were changed and expanded in the following ways:

- UW-Colleges, 13 two-year campuses that function as a single organization, joined the alliance
- Milwaukee School of Engineering (MSOE) joined the alliance
- Marquette University left the alliance

During the first five years of the project, four regional alliances were formed in order to facilitate collaborative relationships between institutions and exchange of resources to support URM student success in STEM disciplines. This map shows how the alliance institutions are distributed across the state.

Figure 1: WiscAMP Institutions and Campuses



WiscAMP Small Grants Program

The Small Grants Program component of the WiscAMP effort provides a mechanism for all alliance institutions to assume a fully participatory role in the activities supported by the LSAMP effort in Wisconsin. WiscAMP institutions are located across a relatively large geographical area, are comprised of a wide variety of academic programs, and serve students with highly diverse needs. Consequently, the identification of programming that can optimize the engagement, retention and graduation of URM students in STEM at each of the institutions requires significant input and participation from our alliance partners. The Small Grants Program allows this process to occur with a view toward institutionalizing expanded programs and program enhancements.

The small grant funded activities allow institutions to:

- Expand and enhance programs that already work for their institution
- Form collaborative partnerships between institutions to leverage efforts and develop resources
- Pilot new programs and use evaluation results to acquire funds

Calls for Small Grant proposals are issued two to three times annually. Proposed projects are reviewed by the Small Grant review committee, which is comprised of a faculty representative from each of the four WiscAMP regional alliances, in addition to the executive director and program evaluator. Based on the committee's recommendation and availability of funds, grants are awarded for up to $25,000 for any single project annually.

The Small Grants Program provides a means to realize the WiscAMP goals by leveraging existing programming and resources at each alliance member campus. WiscAMP has provided 59 small grants to 18 institutions over the last 7 years. Funded activities include 24 implementations of academic enhancement programs, 18 implementations of summer research experiences, 15 implementations of academic year research experiences, 7 implementations of summer bridge programs, and 4 two to four year transfer programs.

Table 2 shows how these programmatic efforts have provided direct student support in the amount of $737,967 for 336 students and an average stipend award of $2039 per student. (The current year of award and activities are not included in these calculations because the full enrollments for students in each small grant are not currently available).

Table 2: Small Grant Summary of Student Support by Grant Year

Grant Year	Total Award for Stipends	Number of Students receiving Stipends	Average Stipend per Student	Other Student Participant Support*
2004-05	$98,407	48	$2,050	$12,565
2005-06	$74,775	76	$984	$28,381
2006-07	$154,600	64	$2,416	$41,185
2007-08	$206,643	97	$2,130	$56,421
2008-09	$119,092	51	$2,335	$40,813
2009-10	$84,450	26	$3,248	$54,605
2010-11	$116,271	ongoing	ongoing	$66,967
Total	$854,238	362	$2039	$300,937

*****Other forms of student participation support include funds used to provide students with travel to conferences, lab materials and books.

WiscAMP Excel: An Alliance-Wide Program

In addition to providing direct support to students through the Small Grants Program, the WiscAMP project developed a more focused program to serve middle performing URM students in STEM in 2009. The WiscAMP Excel program (initially named the Academic Enrichment Program (2009) and then the Academic Acceleration Program (2010)) enrolls URM students whose performance in first year classes threatens their continuation in a STEM discipline. WiscAMP Excel has two goals: The *long-term* goal is to increase the retention of URM (URM) students in STEM disciplines by increasing the skill level of WiscAMP Excel participants and creating a community of STEM students. The *immediate* goal is to increase scientific awareness, skills and knowledge of the program participants in order to increase their interest and subsequent commitment in a science career.

The program is designed to meet these goals by providing a comprehensive, 8-week program of math, science, intensive academic advising, and career exploration.

The WiscAMP Excel program connects students at smaller, less research-extensive institutions with their peers across the state and with UW-Madison, an internationally recognized research institution. Students are able to tour research labs and meet with URM graduate students in STEM disciplines. These connections are reinforced at the WiscAMP annual meeting in the fall and via a Facebook page for all WiscAMP Excel alums.

WiscAMP meets an important need in the state of Wisconsin by providing support to a relatively small but rapidly growing population of URM students. This work is accomplished through Small Grants Program, which builds upon the strengths of existing efforts at the alliance member campuses. In addition, the WiscAMP Excel program provides access to the UW-Madison campus and a community of peers across the state for URM students who are at risk for leaving their STEM major. The next section describes how these efforts over the last seven years have contributed to the transformation of the 22 institutions that are part of WiscAMP and changed the lives of hundreds and potentially thousands of URM students in STEM in Wisconsin.

WiscAMP Program Impact on Student Outcomes

The main goal of WiscAMP is to double the number of URM students who graduate with degrees in STEM in five years. A second goal is to create institutional transformation that will aid and sustain the expanded diversity of students pursuing STEM degrees at campuses in our alliance. Given the rapid growth in URM populations in Wisconsin over the last 10 years and the dire need for a well-trained STEM workforce we know that both goals must be obtained.

The next section presents outcomes with respect to each of the WiscAMP goals. First information about student degree attainment, enrollment and retention is presented. The second part of this section presents information about changes in institutional policies, practices, and climate, particularly in STEM departments. The last part of the section describes the economic impact of these outcomes for students and for alliance institutions.

WiscAMP Student Outcomes: Degree Attainment, Enrollment, and Retention in STEM

The number of bachelor degrees earned by URM students at WiscAMP institutions increased by 45% during years 1-5 of the project. Year 5 saw a 23% increase in degrees awarded from year 4, showing promise of reaching WiscAMP's goal of doubling the number of URM students who earn degrees in STEM fields. With the reconfiguration of the alliance in 2009 to include the Milwaukee School of Engineering and the departure of Marquette University from the alliance, a new baseline was established. Outcomes for Phase 2 of the project indicate that WiscAMP is on track for meeting its goal. On average, the number of URM students who earned degrees in STEM fields has increased by 21% compared to the baseline year of 2008. Table 3 below shows the number of STEM degrees awarded by discipline across all years for the WiscAMP project.

Table 3. Bachelor Degrees for URM[1] Students in WiscAMP Alliance by Discipline

Discipline	2001-02*	2004-05	2005-06	2006-07	2007-08*	2008-09***	2009-10***
Agricultural Science	12	6	5	7	11	11	8
Chemistry	2	3	2	1	3	9	3
Computer Science	35	28	25	33	23	23	34
Engineering	34	50	51	64	55	71	46
Geoscience	5	5	0	1	1	4	4
Life/Biological Science	37	54	72	66	65	75	87
Mathematics	3	5	9	8	5	11	5
Physics/Astronomy	2	2	2	7	1	10	4
Environmental Science	1	0	0	2	5	1	4
Total	**131**	**153**	**166**	**189**	**169**	**215**	**195**

Source: For UW-System Institutions: Office of Policy Analysis and Research, University of Wisconsin System. For Alverno College, Beloit College, Lawrence University and MSOE: Institution Research Office.

[1]URM includes US citizens or permanent residents in the following racial/ethnic categories: African American, American Indian or Alaskan Native or Hispanic

*Academic Year 2001-2002 is the Baseline Year for Phase 1. 2007-08 is the Baseline Year for Phase 2.

**Data for 2001-02 does not include degrees from MSOE.

*** These numbers include students who indicated "2 or more ethnic/racial categories."

Enrollment and degree totals for 2008-2009 and 2009-2010 also reflect changes in how the UW-System schools categorize ethnicity and race. Prior to 2008, only one ethnic/racial identity could be selected when students reported their demographic information upon enrollment. As of 2008, students were able to select two or more categories to report their ethnic/racial identity. In order to most accurately reflect underrepresented minority student enrollment and degree completion in STEM we are including students who are identified by the UW-System as having self-identified with two or more ethnic/racial categories. This may lead to inclusion of students in our enrollment and degree totals who do not fit the NSF definition of underrepresented minorities in STEM, specifically, students who identify as both White and Asian. However the exclusion of the “two or more” category from our reporting would result in a much larger under-count of our students. We are currently working with the UW-System data reporting office to refine how information about enrollments and degrees are extracted for the purposes of providing information that is consistent with NSF definitions. Data disaggregated by gender and race/ethnicity are provided in the appendix of this report.

Figure 2: Project Total and Projected Percent Increase for Bachelor Degrees

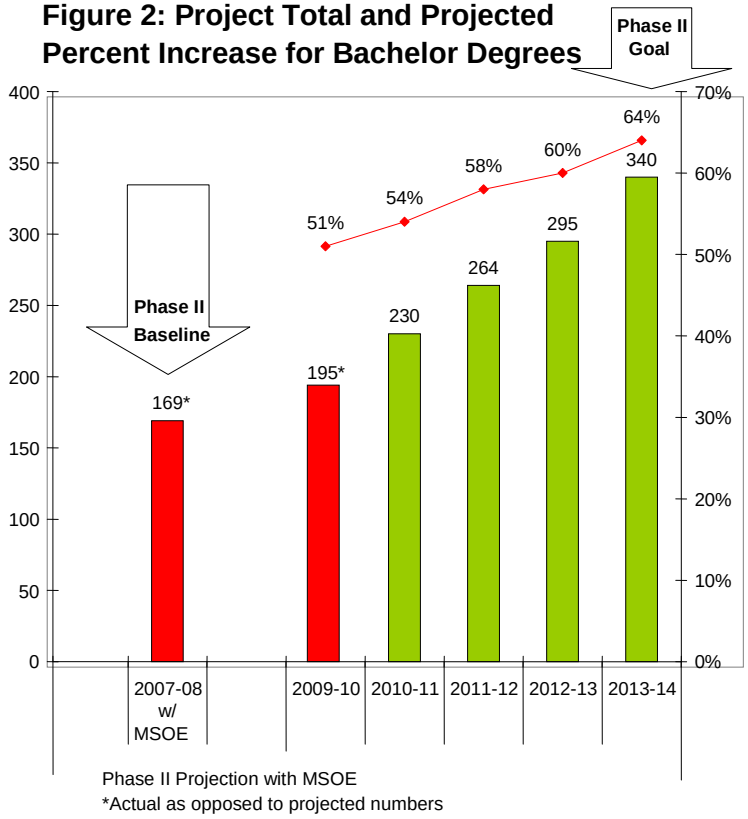
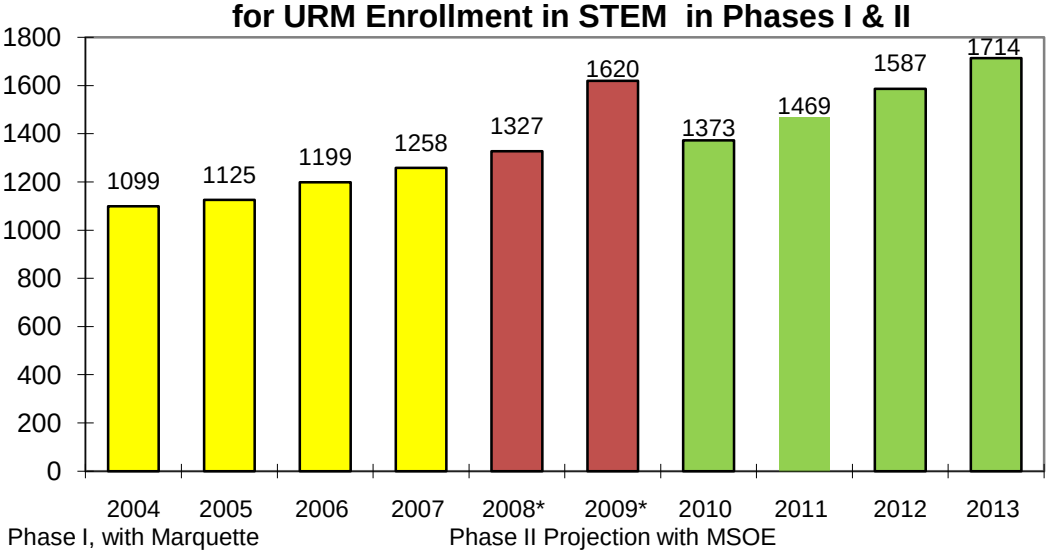


Figure 2 shows the actual degrees awarded to URM STEM majors in 2007-2008 and 2009-2010 as well as the projected degrees for the following years for WiscAMP Phase II.

Degree outcomes for 2010, the most recently available year, are slightly below 205, the number originally projected when the second phase of WiscAMP was proposed. However, enrollment data suggest that the more intensive activities across the WiscAMP project are beginning to have a significant impact on URM students enrolling in STEM disciplines. The enrollment total for 2009, the most recent data available, is a 22 percent increase over the total enrollment of 1327 URM students in STEM who enrolled in 2008, the baseline enrollment for the second phase of the project. In short, the enrollment totals for the WiscAMP project at this point in the second phase of the project indicate important gains with respect to engaging URM students in pursuing STEM degrees.

Figure 3: Project Total and Projected Percent Increase for URM Enrollment in STEM in Phases I & II



* These enrollments include students who selected two or more race/ethnic categories

Qualitative and quantitative evaluation data from the WiscAMP Excel program provide some context for the significance of these outcomes for WiscAMP students.

The WiscAMP Excel program is a useful source for this information because it reflects the experiences of middle-performing students. Students who are performing well and making good progress toward their degrees are well-positioned to participate in mentored research experiences, which in turn can improve the likelihood that a student will remain in STEM and eventually pursue an advanced degree. As was already noted in the description of the WiscAMP Small Grant Program, many research opportunities are available to students through WiscAMP.

> ***I feel very prepared for my math and science courses next year, and for whatever challenges may come my way. The program really helped me to confirm my abilities and discover some that I never knew I had. I would highly recommend the program to any student that feels overwhelmed with their schooling, and unsure about what steps to take towards accomplishing their academic goals.*** *--WiscAMP Excel Student*

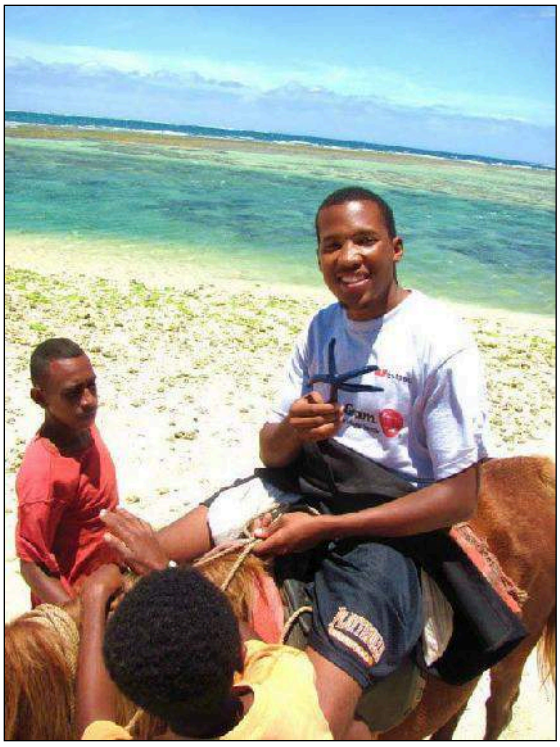
Students who are not performing well are less likely to be invited to work with faculty in a lab; and even if the student is invited to participate in such an experience, the demands of maintaining a strong GPA may still place that student at risk for leaving a STEM major. Because WiscAMP Excel recruits middle-performing students from across the alliance it can provide some broader evidence of outcomes for students at a variety of WiscAMP institutions. On average, WiscAMP Excel students have a GPA of 2.75 (std. = .02) upon application to the program. Admission is contingent upon having received a grade of B/C or lower in a math or science class, having an overall GPA of 2.0, writing an essay that explains why the student thinks the program will help and providing a letter of support from a professor or advisor. Over the three summers that the program has been implemented, students from 12 different institutions have participated. To date, WiscAMP Excel has enrolled 60 students with the most recently enrolled cohort completing the program on July 28, 2011. Retention data for the first two cohorts show that 80% of the students are still enrolled in a STEM major. In addition to retention in the STEM major, approximately 75% of the WiscAMP students in this program indicate they intend to enter a STEM profession at the end of the program.

Eighty percent of WiscAMP Excel students are retained in their STEM major disciplines.

Study abroad experiences

Three of the students who participated in the program two years ago have had study abroad experiences (one in China, one in Fiji, and one in Hungary).

I went to Fiji because of a Study Abroad program through my school which is the University of Wisconsin Platteville. My interest in Fiji stems from my interest in Marine Biology. I want to be a Marine Biologist but because I am attending UW-Platteville (which is in a landlocked state), I will graduate with a Bachelor degree in Ecology. I will pursue a Master and Doctoral degree in Marine Biology in the future. Fiji is an island country in the South Pacific and has the most diverse marine organisms in the Pacific. The possibility of taking marine-related courses to gain experience to prepare me for my Master and Doctoral degree alone was the deciding factor for me to study in Fiji. There are 332 islands in Fiji, and 110 of these islands are inhabited. The capital city of Fiji is Suva. Fiji has two big islands which are Viti Levu and Vanua Levu. I had a chance to visit both of those islands because my school was located in Viti Levu and my study abroad program arranged a trip to Vanua Levu. I arrived in Fiji on July 13th, 2010 and returned back home on November 28th, 2010. I was in Fiji for one semester studying at the University of the South Pacific (USP). USP is one of the premier universities in Oceania. I had the opportunity to take three great classes there: Coral Reef Ecology and Management, Fish and Fisheries Biology, and a Directed Study course. My directed study course was on one of the most important symbols in Fiji which is the tabua. This is a sperm whales tooth that has high value in Fiji. I had a dream experience that assured and reconfirmed my career path and made me more excited to become a Marine Biologist.



Kevin Patterson

UW-Platteville

Keith Jackson (WiscAMP Excel 2009) is a computer science engineering major at UW-Madison. He participated in a summer study abroad program in Hangzhou, China

We got to see a lot of different companies and industrial facilities in Shanghai. It was really interesting to see how everything was run. Some places were very different from what you would expect…It was good to be in a situation where I could learn from a group of people totally different from myself.

Being able to continuously develop and learn more about different countries is great. It definitely won't be the last trip I take. I don't know where I'm going next, but I really want to keep traveling…I want to keep developing my knowledge of other cultures even when I'm not traveling. Studying in China has definitely made me more interested in different parts of the world."

Jean Villagomez, (WiscAMP Excel 2009, pictured fourth from right) is majoring in mechanical engineering at UW-Madison. She participated in an "*Engineers Without Borders"* project in Haiti.

In addition to providing feedback about the program when it ends, students are asked to reflect upon what they have learned over the course of the 8-weeks. One student's story illustrates how her experience in the summer program helped develop her passion for persisting in her chosen career path:

I spent a lot of time speaking to advisors from various schools on the UW-campus---engineering, pharmacy, and nursing to name a few. This was my way of trying to gain a better understanding of what my options were in pursuing a career in the health care field. Though a good idea in theory, this caused confusion for me. Biomedical engineering sounded like an interesting career field to pursue, but so did nursing and pharmacy. So the question was which to pursue? To be quite honest, one of the reasons I entered UW Madison as engineering major is because I had received a significant amount of scholarship money for doing so. Engineering seemed interesting enough, but was it what I wanted to do with my life?...I sought guidance from a recent graduate and soon to be lecturer from the department of biomedical engineering and a practicing industrial engineer. I learned a great deal from both professional sources. ***The first and probably the most important was not to give up on engineering. Not because of the money I would lose if I had decided to switch majors, but because of the opportunities that I would lose out on.*** *I also was able to pick up on some helpful study and networking skills.*

These last eight weeks have been tremendously helpful. They have helped to boost my morale and overall confidence in my ability to succeed academically. In addition to learning more about myself and where I belong on campus, I formed strong, positive relationships with many of the other students. We've all grown to really care for one another, and have supported each other both academically and on a personal level throughout the duration of the program. I've also formed really great relationships with the instructors, and can see myself contacting them during the school year for academic advice. In summary, I believe that the WiscAMP Excel program does a wonderful job of accomplishing what it set out to complete. ***I feel very prepared for my math and science courses next year, and for whatever challenges may come my way. The program really helped me to confirm my abilities and discover some that I never knew I had. I would highly recommend the program to any student that feels overwhelmed with their schooling, and unsure about what steps to take towards accomplishing their academic goals.*** *(--QS)*

QS's experience regarding her choice to persist in engineering as a major while recognizing an interest in health sciences was not unique to her. At least four of the students in her cohort expressly desired careers in the health sciences (e.g., medicine, nursing, or pharmacy) at the beginning of the program and changed their career goals to STEM fields following their participation in the program. In addition to the qualitative evaluation evidence that the program results in increased academic confidence and more refined and focused goals and expectations for careers in STEM, quantitative assessments show students' gain a full semester of knowledge based on their math assessments after the program.

The data presented here confirm that the WiscAMP program is having a significant impact on the numbers of URM students who pursue STEM degrees in Wisconsin. In particular, URM student enrollments in STEM are increasing at a rate 5 times that predicted in the proposed outcomes for the second phase of the WiscAMP project. These successes should be further born out in the next two years as WiscAMP stays on track for doubling the number of URM students who earn bachelor degrees in STEM disciplines. We feel confident in this outcome given the more nuanced successes we have been able to learn about from our qualitative evaluation of the WiscAMP Excel program. The next section addresses how these efforts are creating institutional transformation.

Measuring the WiscAMP Program Impact on Institutional Transformation

The implementation of the WiscAMP project in 2004 coincided with a variety of new and ongoing efforts statewide to expand participation in STEM at all levels of education and to develop the equity, diversity, and inclusiveness of higher educational institutions. Even so, WiscAMP is the largest program in the state that addresses the needs of URM students in STEM specifically. The composition of the WiscAMP alliance ensures a statewide impact for the project. Just as important, the composition of the WiscAMP governing board, which includes all provosts or presidents from alliance member institutions, and is chaired by the Senior Vice President for Academic Affairs for the UW-System provides a means to coordinate and leverage efforts across and within institutions. The board meets annually to provide guidance to the WiscAMP Co-PIs and Executive Director regarding small grant programming efforts and to be oriented to the project when there is change in administrative leadership. Informal conversations with WiscAMP Small Grant PIs, administrators for extramural funding at WiscAMP member institutions, and campus liaisons for the project confirm that WiscAMP governing board members actively promote WiscAMP Small Grants Programming opportunities to their deans and faculty in STEM. For these reasons, we assert that many of the efforts to broaden participation in STEM for URM students at our alliance institutions are due at least in part to the WiscAMP program.

This section provides four case examples of significant institutional transformation as a direct consequence of the WiscAMP program activities. Two of the case examples describe large program efforts across institutions and two describe more discrete transformations in institutional culture (at Alverno College) and policies (at UW-Milwaukee). Finding a meaningful metric that can capture institutional transformation presents a significant challenge, particularly given the diversity in size, composition, geographic location, and student communities that characterize each alliance member campus. Examples of how WiscAMP programs have led to significantly larger efforts include the following two illustrative examples:

Large Transformations Across Institutions

UW-Stout and UW-Manitowoc NSF-STEP Collaboration. In round seven of the small grants program, UW-Stout was awarded $25,000 to create a "bridge to the baccalaureate" program that targeted underrepresented minority students in collaboration with UW-Manitowoc, a 2-year college. The collaboration eventually led to a successful application for NSF STEP funding of a project entitled, ***Opening the Portals of Discovery: Increasing Opportunities in STEM through Collaborative Research.***

The Portals of discovery is a partnership between the UW-Colleges and the UW-Schools, designed to engage and retain students in STEM fields through collaborative research. Students move through a pipeline of STEM education from high school to a two year, associate degree-granting institution and then to degree completion at the baccalaureate institution. The goals of the project are to recruit new populations of STEM students, retain STEM students during the crucial early stages of their education, and see those students through to the completion of their baccalaureate degrees. The project includes 1) summer research workshops and research-based curriculum development at the high school level, 2) financial support, peer tutoring, faculty and peer mentoring circles, curriculum development, and participation in undergraduate research at the two year campus, and 3) a 10-week research immersion program for transferring students, continued faculty mentoring, participation in undergraduate research, and student opportunities to serve as peer mentors at the 4-year campus.

University of Wisconsin-Manitowoc

The complete integration of research, coursework, and mentorship across institutions ensures that STEM students have a persistent support network throughout their undergraduate career. Research activities develop critical thinking, technical skills, and confidence. Outreach and mentor support networks reach students of diverse demographic backgrounds who otherwise would be unlikely to pursue or persist in STEM education. The model is being developed for expansion across all twenty six UW-System two and four year campuses, resulting in a comprehensive effort to alleviate Wisconsin's need to increase the technology workforce. WiscAMP small grant recipients are encouraged to apply for Portals of Discovery collaboration grants in order to increase the impact of their small grant efforts.

College of Menominee Nation (CMN) NSF-TCUP Awards. In year 4 of the WiscAMP program, the College of Menominee Nation was awarded a $25,000 Small Grant to provide CMN students with academic enhancement programming at CMN and at the UW-Madison campus in order to prepare students to transfer to a 4 year school and persist in completing their STEM bachelor degrees.

The collaborative partnership that developed between the Dr. Manuela Romero, then Executive Director for WiscAMP and the administrative leadership of the CMN led to the successful receipt of 3 TCUP awards (2 renewals, 1 new award) in the last two years for the CMN.

> ***Our vision is for the College of Menominee Nation to evolve into a research institution.***
>
> *-- Dr. Diana Morris*
> *Dean of Letters & Science*
> *College of Menominee Nation*

In particular, the recently awarded ***Collaborative Research: CMN PEEC Project: Providing for the Education of American Indian Engineers*** project involves the CMN, UW-Madison and UW-Platteville. The project will support the development of an associate degree in pre-engineering at CMN and create a transfer program for CMN students to UW-Platteville and UW-Madison Engineering programs. The impact of CMN's efforts to expand

STEM engagement and programming for its students is evidenced by the 163% increase in URM students enrolled in STEM at CMN over the last three years.

Both the College of Menominee PEEC Project and the UW-Colleges and Schools Portals of Discovery STEP project reflect broad scale efforts to expand participation in STEM. The WiscAMP program also includes examples of specific programming efforts to transform institutional culture and policies that will increase the number of URM students engaged and retained in STEM disciplines.

Significant Transformations at Individual Institutions

Alverno College. **WiscAMP funded activities at Alverno College provide a smaller example of how this program has created institutional transformation. Alverno College is a small, liberal arts women's college in Milwaukee. Almost one third of enrolled students at the college are URM as defined by the LSAMP program, however only about 6 percent of enrolled students are enrolled in STEM disciplines. Dr. Angela Frey, a biologist by training and the Associate Dean for Math and Science has led an effort at Alverno to increase the number of undergraduates who choose to pursue degrees in STEM. Through a unique peer mentoring program and a summer research program provided through a collaborative arrangement with UW-Milwaukee, Dr. Frey has succeeded in engaging more URM students in STEM degrees at Alverno. Specifically, enrollments in STEM majors at Alverno have increased 37% for URM students and 26% for majority students between fall 2007 and 2009. Notably, no gains appear in non-STEM enrollments.**

The marked increase in STEM enrollments at Alverno, particularly for URM students, reflects a transformation in the way science is perceived as a culture. Dr. Frey meets weekly with junior and senior students in STEM to provide support and guidance to them regarding their meetings with the first and second year students they are mentoring. Dr. Frey describes these meetings as very informal and even commented that conversation will drift into more feminine topics like "nail polish colors and hairstyles." These conversations reflect the richness of the peer support community for URM students in STEM at Alverno as opposed to a lack of seriousness or commitment on the part of the students. Peer mentors have taken the initiative with respect to suggesting that their

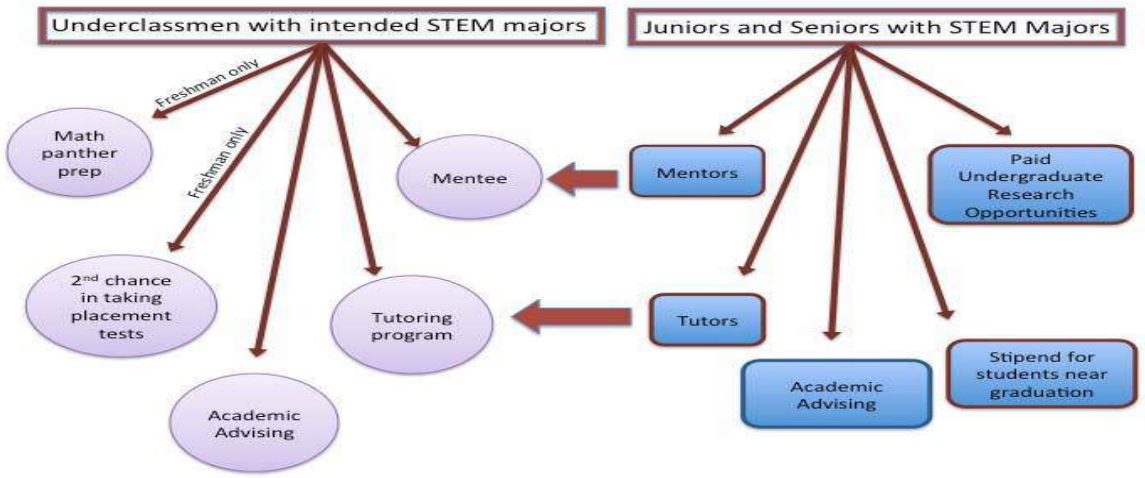
mentees apply to present at undergraduate research conferences and attend the WiscAMP annual meeting.

UW-Milwaukee.

WiscAMP programming at UW-Milwaukee has increased significantly over the last three years. During the first phase of the WiscAMP program, UW-Milwaukee activities were able to engage some students in research experiences and academic enrichment activities. The WiscAMP evaluation process led to a close examination of the very high enrollment numbers and the very low completion rates for URM students in STEM at UW-Milwaukee.

In response to the clear need for intensive programming, UW-Milwaukee created a new staff position for an undergraduate research coordinator (URC). The URC began to work closely with the WiscAMP program office, the academic support services and the office of multicultural student services at UW-Milwaukee in addition to STEM faculty in order to develop the Advancing Leadership of Tomorrow's Scientists (ALofTS), a comprehensive program to support URM students majoring in STEM disciplines across all phases of their undergraduate studies. This project is jointly funded through the WiscAMP Small Grant program and the UW-System Closing the Gap grant program. Figure 4 below provides a diagram of the program design.

Figure 4. Advancing Leadership of Tomorrow's Scientists (ALofTS) at UW-Milwaukee



URM freshman and sophomore students with intended STEM majors (shown on the left in Figure 4) will be enrolled in the programs (designated in purple) centered round mentoring, tutoring and advising. Students with math placement below intermediate algebra will either take the "Math Panther Prep" summer bridge program or retake the math placement tests. URM juniors and seniors (shown on the right side of the diagram) will receive academic advising. Some students will be mentors and tutors for underclassmen. Upperclassmen students will have the opportunity to participate in undergraduate research. A stipend program with targeted career and academic advising will be available for senior students within 30 credits of graduation. Red boarder boxes indicate WiscAMP funded programs. WiscAMP and UW-System Closing the Achievement Gap funds will cover both Undergraduate Research Opportunities and Stipends.

The four cases described above illustrate how WiscAMP has had a very large, meaningful, and direct impact on programming across the state of Wisconsin to broaden participation in STEM. The two large programs that grew from two separate WiscAMP Small Grant funded projects provide striking examples of how the WiscAMP program has led to radical transformation in the resources available to and collaborative relationships between WiscAMP member institutions. Two of the examples (Alverno College and UW-Milwaukee) illustrate the diverse needs and program elements required to support the success of URM students in STEM in the Milwaukee area. The largest concentration of URM students in the state are in the Milwaukee area. The transformation of the institutional climate in STEM at Alverno College and the changing policies

to support the success of URM students in STEM at UW-Milwaukee signal lasting impact of the WiscAMP program on WiscAMP campuses.

Measuring the WiscAMP Program Economic Impact

The WiscAMP program has a documented impact on both student lives and institutions. Since the WiscAMP project began in 2004, over 1500 URM students at WiscAMP institutions have earned bachelor degrees in STEM. Student enrollments in STEM disciplines have markedly increased over course of the project and in the last two years in particular. For students, the opportunity to complete a degree in STEM has a very significant impact on their job prospects as well as their potential income. According to a July 14, 2011 report from the U.S. Department of Commerce, the STEM occupations are projected to grow by 17% between 2008 and 2018 compared to non-STEM occupations which are projected to grow by 9% over the same period.[1] STEM workers with bachelor degrees earn just under $36 per hour, 26% more than their non-STEM counterparts who earn just over $28 per hour. ***These differences translate into a $12,000 difference in annual salary.***

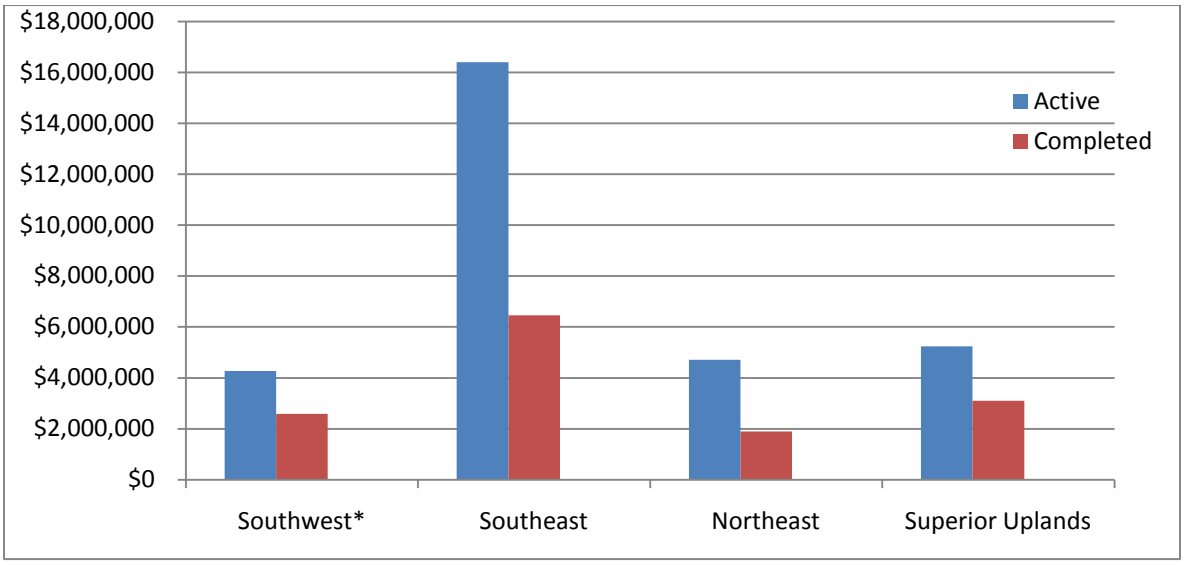
Similarly, the WiscAMP project has had a significant impact on the alliance institutions. These changes have had economic consequences for the institutions and will in turn lead to more opportunities for students.

Both the CMN PEEC project and the UW-Colleges Portals of Discovery STEP program illustrate how the WiscAMP program creates opportunities for institutions to expand the size and scope of their efforts to broaden participation in STEM. In order to provide some information about how support for WiscAMP-related, if not directly supported, activities can lead to extramural funding, we conducted a systematic search of NSF awards, both active and expired. Specifically, we searched for all awards that involved STEM undergraduate education to WiscAMP alliance member institutions from 2005 onward. We conducted the search with and without the term "minority" included in the search. In both instances the search results were the same. This would indicate that successful awards, regardless of the scope of the award, *are* directed toward expanding participation in STEM. Some of the awards involved very extensive programming for URM undergraduates in STEM (including WiscAMP and PEEC). Other awards were more specifically for basic research and included research opportunities for undergraduates with a specific reference to encouraging underrepresented minorities to participate in these opportunities. The NSF awards were selected for this search because NSF provides support to a more diverse range of educational institutions. When we ran a similar search on the National Institutes of Health award database, only institutions with doctoral programs in STEM (UW-Madison, UW-Milwaukee, MSOE) returned with successful hits.

[1] Langdon, D., McKittrick, G., Beede, D., Khan, B., & Doms, M. (2011). *STEM: Good Jobs Now and for the Future.* U.S. Department of Commerce, Economics and Statistics Administration, Office of the Chief Economist. Washington, D.C.

Overall, there are 325 active NSF-funded projects that involve STEM undergraduate training or education in one form or another currently underway at WiscAMP institutions. However, the awards are not distributed evenly, and 235 of them (72%) are held at UW-Madison for a total of $153,245,999 awarded to date for projects that involve undergraduate education in STEM at UW-Madison. When UW-Madison is excluded from the analysis, the allocation of active and expired NSF dollars for projects that involve undergraduate education in some way is more even. Figure 4 below shows the break out of NSF awarded support to WiscAMP institutions grouped by regional alliance. Support to activities at UW-Milwaukee (in the Southeast Region) reflects the larger size of the school and the number of STEM graduate programs at that institution.

Figure 5: NSF Awarded Support to WiscAMP Institutions by Regional Alliance for Projects that Support Undergraduate Learning in STEM 2005-2011



* Data for the Southwest excludes UW-Madison

What these data show is that the WiscAMP institutions are having some success with respect to obtaining extramural funding for undergraduate education in STEM. In fact, all WiscAMP institutions except for UW-Green Bay and UW-Superior have an active award that was received in the last six years. The numbers of active awards to WiscAMP institutions by directorate are presented below in Table 3. The data are provided with UW-Madison included and excluded in order to show that WiscAMP alliance institutions are engaging in successful research efforts and programming that involve undergraduates in STEM across a range of disciplines.

Table 4. Average Award Amount and Number of Grants Awarded by NSF Directorates to WiscAMP Alliance Institutions 2005-2011

NSF Directorate	Mean Amount Awarded including UW-Madison	N of Awards including UW-Madison	Mean Amount Awarded excluding UW-Madison	N of Awards excluding UW-Madison
BIO	$580,504.31	81	$365,797.44	18
CSE	$356,167.43	14	$256,828.00	2
EHR	$624,323.20	30	$488,485.62	21
ENG	$379,419.76	63	$295,118.73	11
GEO	$476,406.43	23	$290,587.40	5
MPS	$749,215.30	86	$325,500.09	23
O/D	$258,573.25	8	$148,773.00	5
OPP	1, 159,236.22	9	$146,432.50	2
SBE	$192,203.64	11	$273,822.67	3
Total	$568,142.00	325	$348,890.57	90

The data presented in this section provide evidence for a far-reaching and long-lasting economic impact of this project. WiscAMP is growing a more diverse STEM-educated workforce. Research evidence indicates that WiscAMP students will earn more, are more likely to pursue graduate education, and are more likely to find and keep jobs than their non-STEM educated counterparts.

With respect to the economic impact of this project on the WiscAMP alliance institutions, there is clear evidence that the program has likely been expanded through leveraged support. Hundreds of thousands of dollars on average have been successfully obtained by WiscAMP alliance institutions in order to broaden the scope of the undergraduate education and research opportunities available at their campuses. These data are presented so that the research extensive activities at the UW-Madison are factored out for comparison. This is an important consideration so that the efforts of smaller campuses and programs with fewer opportunities for basic research are not overlooked.

Review and Conclusions

The data and analysis presented here provide strong evidence that the WiscAMP program is making good progress toward its goals of increasing the number of URM students who successfully obtain their bachelor degrees in STEM disciplines and creating institutional transformation in order to support and sustain expanded participation in STEM at all WiscAMP alliance institutions. Graduation rates for URM students in STEM are steadily increasing and enrollment rates are growing at a faster pace than was projected only two years ago. These successes reflect the strong programming efforts that have taken place across the WiscAMP alliance institutions and the readiness of WiscAMP presidents, provosts, faculty and staff to take advantage of opportunities on their own and other campuses to share their resources and change how they do their work. As a result WiscAMP students are persisting in their STEM majors and those who have engaged directly in WiscAMP programs have become more committed to their academic pursuits.

WiscAMP institutions are transforming the climate of STEM disciplines so that students feel there is a place in their major for people who look and talk like they do. WiscAMP institutions are also changing how academic programs are structured so that more diverse students can have access to STEM disciplines through transfer programs and complete their degrees within five years. WiscAMP provosts and faculty are changing their institutional policies with respect to how students access academic support programs in order to ensure students are getting the support they need before they run into problems with their courses. Finally, WiscAMP institutions have been proactive about obtaining support to expand the undergraduate education and research opportunities at their campuses. These efforts have a profound impact on the WiscAMP students who are participating in programs now.

Most importantly, these efforts will shape the experiences for generations of students to come by providing more support, more opportunities, more inclusiveness and equity for any student who wishes to follow a STEM career pathway. The rewards of a successful STEM undergraduate experience for WiscAMP students translates into highly successful STEM professionals who are also more likely to pursue further education. WiscAMP will document these outcomes and update these findings in future reports.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Appendix

STEM Degrees Awarded by Ethnicity/Race and Gender

Year	STEM Non/STEM	Gender	Black/ Af. American	Hispanic Latino	Native American	Haw./ Pac. Isl.	Two or More	White	Asian
2008	STEM	Male	38	56	14	0	1	3102	140
		Female	19	30	13	0	3	1698	81
	STEM Total		57	86	27	0	4	4800	221
	Non-STEM	Male	194	155	36	0	0	6890	215
		Female	270	272	76	0	5	11172	341
	Non-STEM Total		464	427	112	0	5	18062	556
Year TOTAL			521	513	139	0	9	22862	777
2009	STEM	Male	50	63	27	0	5	3047	144
		Female	23	29	15	1	2	1830	108
	STEM Total		73	92	42	1	7	4877	252
	Non-STEM	Male	166	174	51	0	10	7029	225
		Female	289	279	85	1	20	11221	366
	Non-STEM Total		455	453	136	1	30	18250	591
Year TOTAL			528	545	178	2	37	23127	843
2010	STEM	Male	29	56	14	1	9	3191	168
		Female	28	37	12	0	9	1791	86
	STEM Total		57	93	26	1	18	4982	254
	Non-STEM	Male	182	217	40	2	20	7088	196
		Female	319	300	82	3	46	10814	366
	Non-STEM Total		501	517	122	5	66	17902	562
Year TOTAL			558	610	148	6	84	22884	816

STEM Enrollments by Ethnicity/Race and Gender

Year	STEM Non/STEM	Gender	Black/ Af. American	Hispanic Latino	Native American	Haw./ Pac. Isl.	Two or More	White	Asian
Fall 2007	STEM	Male	270	335	105	0	1	15085	735
		Female	232	173	73	0	6	8438	373
	STEM Total		502	508	178	0	7	23523	1108
	Non-STEM	Male	1639	1316	363	0	13	41239	1728
		Female	2517	1951	569		24	57887	2356
	Non-STEM Total		4156	3267	932	0	37	99126	4084
2007 Total Enrollments			4658	3775	1110	0	44	122649	5192
Fall 2008	STEM	Male	273	330	95	5	64	15502	445
		Female	243	198	76	2	41	8650	272
	STEM Total		516	528	171	7	105	24152	717
	Non-STEM	Male	1690	1328	354	27	294	41430	899
		Female	2545	1975	537	27	428	57314	1238
	Non-STEM Total		4235	3303	891	54	722	98744	2137
2008 Total Enrollments			4751	3831	1062	61	827	122896	2854
Fall 2009	STEM	Male	299	346	76	13	174	16128	746
		Female	292	226	67	3	124	8867	374
	STEM Total		591	572	143	16	298	24995	1120
	Non-STEM	Male	1743	1343	289	56	693	41660	1702
		Female	4825	3496	866	102	2019	109909	4466
	Non-STEM Total		6568	4839	1155	158	2712	151569	6168
2009 Total Enrollments			7159	5411	1298	174	3010	176564	7288

WiscAMP-Related Publications

Byars-Winston, A. Estrada, Y., Howard, C., Davis, D., & Zalapa, J. (2010). Influence of social cognitive and ethnic variables on academic goals of underrepresented students in science and engineering: A multiple-groups analysis. *Journal of Counseling Psychology*, *57*, 205-218.

Castellanos, E. 2009. Sediment Analysis of the Lake Mills Marsh.

Castro, G. Longitudinal. 2009 profile of water quality: Whitewater Creek Watershed, South Central Wisconsin.

Crafton, J. is working with Dr. Catherine Chan on a publication: Effects of high volume pharmaceuticals on the growth of *Arabidopsis thaliana.*

Crafton, Jasmine was recently featured in the *Whitewater Magazine*.

Curran, K.L., LaRue, S., Bronson, B., Solis, J, Trow, A, Sarver, N., Zhu, H. 2008. Circadian genes are expressed during early development in Xenopus laevis. PLoS ONE 3 (7) e2749-e2749.

Kuzoff, R.B., Kemmeter, S.B., McKinnon, J.S., Thompson, C.P. 2009. Phylogenetic analysis: How old are the parts of your body?. Evo Edu Outreach 2:405-414.

Thompson, C.P. is currently working on a publication with Dr. Robert Kuzoff titled: Bioinformatic Study of Whale Origins for the high school biology classroom.

Sorenson, G.P., Coppage, K.L., & Mahanthappa, M.K. (2011). Unusually stable aqueous lyotropic gyroid phases from Gemini dicarboxylate surfactants.