



National Science Foundation
Directorate for Education and Human Resources (EHR)
Division of Undergraduate Education (DUE)

STEP 2011: Institutional Culture, Institutional Change & Institutionalization
Science, Technology, Engineering, and Mathematics Talent Expansion Program (STEP)
2011 Grantees Meeting

March 17-18, 2011
Omni Shoreham Hotel
Washington, D.C.

Abstract Packet

Abstracts submitted by February 22, 2011 are included in the printed packet. They are arranged by Poster ID (see "Poster Sessions" handout for the complete list). Abstracts submitted after February 22 will be included with other meeting materials on the STEP Central website.

Table of Contents:

| Cluster No. | Cluster Topic | Pages |
|--------------------|---|--------------|
| 1 | Bridge Programs | 2 - 15 |
| 2 | Curriculum Development | 16 - 22 |
| 3 | Mentoring/Tutoring/Advising Programs | 17 - 52 |
| 4 | Two-year/Four-year Partnerships | 53 - 70 |
| 5 | Type 2 Projects & Special Projects | 71 - 74 |
| 6 | UG Research/Internships | 75 - 92 |
| M | Miscellaneous | 93 |
| N | New Projects (Abstract only; no poster) | 94 - 101 |

Poster Abstracts

Poster #: 1 – 01 Session: A Lead Institution: **Middle Tennessee State University**

Authors: **Tom Cheatham**
 Ginger Rowell
 Don Nelson
 Chris Stevens
 Elaine Tenpenny

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| PhD | Math | Year 1 | Type 1B | 0969571 | TN |

Poster Title: **Mathematics as a FirstSTEP to Success in STEM**

Keywords: **Math Preparation**

Poster Abstract: The Middle Tennessee State University (MTSU) FirstSTEP program focuses on retention of freshman and sophomore STEM majors who are poorly prepared in mathematics. Without the background knowledge and skills needed to succeed in a college STEM major, these students enter college with a strike against them. FirstSTEP recruits a cohort of 50 STEM majors whose math ACT is between 19 and 23 inclusive and provides a set of experiences to help prepare them for success in STEM. Activities are focused on mathematics preparation but include life and college skills as well. In the summer before they begin their freshman year in college, the cohort spends two weeks in a summer math bridge program that assesses their deficiencies in mathematics and tries to address them. Believing that providing context for learning is important, students also learn how mathematics is used in their disciplines. During their freshman and sophomore academic years, we enroll the cohort in a one-credit pass/fail seminar to facilitate communication, to help them stay on track in mathematics, and to provide college and life skills. In the summer before their sophomore year, we engage the students in in-depth, pre-research team activities so they will experience intense study in a STEM area. The latter component will be new in summer 2011. The first summer (2010), we recruited 35 students but feel that with a full time frame for recruitment, we will be successful in attracting 50 students for the second cohort. We have learned by working with the first cohort that there will be surprises. We will have additional interventions in place for the second cohort.

Poster #: 1 - 02 Session: B Lead Institution: **University of Central Oklahoma**

Authors: **Wei Chen**
Charlotte Simmons
Melville Vaughan
John Barthell
Gregory Wilson
Beverly Endicott

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 2 | Type 1B | 0856396 | OK |

Poster Title: **Faculty Mentoring and Student Retention among STEM Majors**

Keywords: **Recruitment, Peer Tutoring, Peer Mentoring, UG Research/Internship Opportunities**

Poster Abstract: Undergraduate research supervised by faculty mentors is a demonstrably important factor in recruiting and retaining STEM students. It is also crucial to continue student support through scholarships and networking beyond their first year. In the past seven years, the University of Central Oklahoma (UCO) has established a successful Summer Bridge Program for incoming freshmen through NSF STEP grants. The major component of the Summer Bridge Program is a hands-on experience in research activities mentored by STEM faculty at UCO. A scholarship program has recently been established for the Summer Bridge students under an NSF S-STEM grant that provides financial support for eligible Summer Bridge participants for up to four years. A support network has also been established for participants, including regular gatherings and individual monitoring and mentoring. The STEP and S-STEM grants have proven to be synergistic in student recruitment and retention. The caliber of the Summer Bridge students has noticeably improved and the first year retention rate for the Summer Bridge/S-STEM scholars was 92% (24 of 26). The only student who switched to a non-STEM major opted out of the undergraduate research during her freshman year. Our early findings strongly suggest that faculty mentoring and continued student support are the keys to increasing STEM majors.

Poster #: 1 - 03

Session: C

Lead Institution: **Angelo State University**

Authors: **Connie Russell**
Katherine Price-Blount
J. Kelly McCoy

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 2 | Type 1A | 0856657 | TX |

Poster Title: **Our "First Year Experience" with Angelo State University's "Science Partnership for Undergraduate Recruitment, Retention, and Success" (SPURRS) Program**

Keywords: **Recruitment, Peer Mentoring, Introductory courses**

Poster Abstract: Angelo State University was funded in 2009 to implement "Science Partnership for Undergraduate Recruitment, Retention, and Success" (SPURRS) to develop strategies that will assist students to reach their academic and career potential. At ASU, there is a significant difference between the number of students initially majoring in STEM fields and the number of STEM degrees awarded. Although the one-year retention rate for first-time full-time freshmen STEM majors is better than the university-wide retention rate, their retention in a STEM major is markedly lower. Fewer than 40% of incoming STEM students who are retained at the university remain in STEM. This migration from STEM to non-STEM majors during the freshman year is likely a result of difficulty in, and the lack of preparation for, the introductory course sequences in these majors.

SPURRS is addressing the gaps in STEM majors' college readiness by:

- Placing STEM students in major-specific First Year Experience cohorts initially formed during a pre-college Critical Thinking Boot Camp designed to develop skills and strategies for succeeding in introductory STEM coursework
- Following the Boot Camp with a first semester Critical Thinking Seminar
- Implementing mandatory tutoring for introductory sequence STEM courses
- Implementing a peer mentoring program
- Providing career/graduate school advising modeled after ASU's successful Health Professions Advisory Committee model to retain students to graduation.

During the Fall 2010 semester, we piloted our first summer "boot camp" with 28 incoming freshman. Held the week before the Fall 2010 regular semester, students participated in activities designed to help them start to make the transition between high school and college level math and science classes. Following the week-long boot camp, students were required to enroll in one of two sections of a semester long SPURRS specific "Critical Thinking" course. Our poster will describe the activities of each of these components and include plans for improving the program next summer.

Poster #: 1 - 04

Session: A

Lead Institution: **University of Memphis**

Authors: **Donald Franceschetti**
John Haddock
Regina Hairston
Stephanie Ivey
Rachel Best

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| PhD | All STEM | Year 3 | Type 1A | 0756738 | TN |

Poster Title: **MemphiSTEP: A STEM Talent Expansion Program at the University of Memphis**

Keywords: **Math Preparation, Peer Mentoring, UG Research/Internship Opportunities, Learning Communities, Program Evaluation**

Poster Abstract: MemphiSTEP (MSTEP) is a five-year project designed to increase the number of majors and graduates across the STEM areas at the University of Memphis (U of M). The project implements a number of core strategies designed to increase persistence to graduation, including a summer Mathematics Bridge Bootcamp, research experiences for undergraduates, peer and faculty mentoring, grants for on-campus professional student organizations such as the Society of Women Engineers or the Math Cantor Sect to help increase active membership, and STEM learning communities. Analyses of project impact for the first two years of the project (2008-09 and 2009-10) suggest MemphiSTEP is helping to foster increased STEM graduation numbers at the U of M. Both U of M STEM graduation and persistence (retention plus graduation in STEM) numbers have increased since the onset of the MemphiSTEP project in 2008. Further, of the STEM students enrolled at the U of M, 5.9% were impacted by the project in Year 1 compared to 11.2% in Year 2. Finally, comparative analyses indicated that students who participated in Year 1 and Year 2 MemphiSTEP activities were more likely to persist in STEM (be retained or graduate) than other, non-participating students enrolled in STEM at the U of M during Year 1 and Year 2.

Poster #: 1 - 05

Session: B

Lead Institution: **James Madison University**

Authors: **Bob Kolvoord**
Roman Miller
Kenneth Overway
Kenneth Phillips
Raymond McGhee
Jennifer Sowers

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|---------------------------------|---------------------|---------------|----------------|----------------|-----------|
| Multi-school Partnership | All STEM | Year 3 | Type 1A | 0756838 | VA |

Poster Title: **Bridging the Valley: A STEP Ahead for STEM Majors - Building STEM Enrollments Among and Within A Diverse Range of Institutions**

Keywords: **Math Preparation, Peer Mentoring, UG Research/Internship Opportunities, Learning Communities, Faculty & Staff Development, Program Evaluation**

Poster Abstract: In the Bridging the Valley A STEP Ahead for STEM majors project, a consortium of four Shenandoah Valley higher education institutions (Blue Ridge Community College, Bridgewater College, Eastern Mennonite University and James Madison University) are collaborating on a series of activities to induce students to, and retain them in STEM majors on the different campuses. At each of our institutions we have faced declining enrollments in some or all of our STEM programs and there is an impetus to reverse this trend. We are also concerned about the diversity of our STEM majors. As a consequence, we are conducting the following activities in this Type 1A project to increase the enrollment and graduation of STEM majors on our campuses: i) A summer bridge program for entering students to build their mathematics skills, to introduce the range of STEM majors available to students at the various institutions and to introduce them to STEM-based problem solving with real world problems; ii) A unique set of coordinated learning communities across the campuses that will focus on STEM themes; iii) Building on our connection with the Shenandoah Valley Partnership, a Shenandoah Valley consortium of governmental, business and educational institutions, to offer STEM-based internship and employment opportunities; iv) A set of STEM faculty development activities given jointly between the four campuses to build faculty awareness of key issues in retaining students in STEM majors and skills in alternative pedagogical approaches; v) Outreach activities to K-12 teachers and counselors to help build and sustain interest and demand for STEM majors after the end of the project; and vi) Campus-specific activities that will focus on unique STEM issues and programs at each of the four institutions. We have partnered with SRI, International. for an extensive formative and summative assessment of our efforts.

We are currently in the third year of the project and we can report some promising indicators that we are on track to meet our goals of increasing the number of STEM graduates. Overall STEM majors are up by ~25% (more than 750) in aggregate across our campuses. In fact, Bridgewater College has seen an ~90% increase in majors. Our Summer Bridge program has been effective in building the mathematics skills and STEM interest of students who in the past have declared STEM majors but not persisted to a STEM degree. Our learning community work has helped to support students during their transition to higher education and we've developed a great working relationship between four diverse institutions.

Our internship efforts are growing and will continue to build as the initial students in our Summer Bridge program progress into their later college years. We've had good participation in our Faculty Development workshops, but we're struggling to reach a broader cross-section of STEM faculty.

In our poster, we'll share our results to date, including the successes and challenges we've encountered on our campuses. We'll also share assessment results that document those successes and challenges. • Peer-led team learning has been expanded to six courses in math, two in chemistry, one in physics, one in biology and one in developmental writing (previously just one math course), with a structure for student and faculty training in place. Learning communities are being expanded to STEM disciplines.

Successes

- STEM enrollment increased by 153 students (4.5%) in two years
- STEM bachelor's degrees increased from 203 in 2005-6 to 225 in 2007-8, up 11%

Poster #: 1 - 06 Session: C Lead Institution: **Northern New Mexico College**

Authors: **Anthony Sena**
Ivan Lopez
Jorge Crichigno
Ulises Ricoy

| | | | | | |
|------------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Bachelors | All STEM | Year 3 | Type 1A | 0757088 | NM |

Poster Title: **Project Aspire**

Keywords: **Recruitment, Math Preparation, Peer Tutoring, Peer Mentoring**

Poster Abstract: Mentoring and tutoring, together with consistent provision of resources form the basis for ensuring success by STEM students at Northern New Mexico College. The majority are at-risk of not completing a STEM degree before entering the programs. Continued service and resources provisioning are facilitating matriculation, recruitment and enhancing retention, and ultimately graduation and consideration of advanced STEM degree. Northern's STEM programs students are 95% Hispanic.

Poster #: 1 - 07

Session: A

Lead Institution: **Ohio State University**

Authors: **David Tomasko**
Judy Ridgway
Susan Olesik
Larry Mayer
Mark Nutter

Elizabeth Bossley
Sevinc Erdal
Linda O'Brien
Kelly Mullane
Janet Schilling

| | | | | | |
|---------------------------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Multi-school Partnership | All STEM | Year 3 | Type 1A | 0756986 | OH |

Poster Title: **Ohio’s Sustainable Science and Engineering Talent Expansion Program (OSTEP) – Bridges to Success**

Keywords: **Recruitment, Math Preparation, Peer Mentoring, Articulation & Transfer Issues, Introductory Courses, Underrepresented Students**

Poster Abstract: The OSTEP program builds bridges to success in STEM disciplines in three distinct socio-economic regions of the State of Ohio. Three community colleges (Columbus State Community College, Stark State College and Washington State College) are partnered with the state’s land-grant comprehensive research university, Ohio State University, to recruit and serve a wider population of potential STEM majors. All STEM disciplines are represented to ensure an increase in new STEM majors as opposed to redistribution among the disciplines. Centered around effective summer bridge programs with curricular and industrial or research internship components, the program will house pre-college initiatives to introduce students to career options and funnel them into STEM programs at the college and university level. Finally, peer-mentoring and academic support structures will be housed at multiple points within the colleges and university to maintain continuous support through to graduation.

Poster #: 1 - 08 Session: B Lead Institution: **Central Washington University**

Authors: **Wendy Bohrson**
Sarah Nagorsen-Rinke
Maria Godinez
Andy Piacsek
Lisa Ely

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 4 | Type 1A | 0653094 | WA |

Poster Title: **Central Washington University Science Talent Expansion Program: Recruiting and Retaining the Next Generation of STEM Professionals**

Keywords: **Recruitment, UG Research/Internship Opportunities, Student Tracking, Underrepresented Students**

Poster Abstract: The Central Washington University (CWU) STEP program emphasizes recruitment and retention of freshmen, sophomores and community college transfer students, particularly those who are traditionally underrepresented in STEM fields. The main elements of our program include (1) recruitment of students from traditionally underrepresented-serving high schools and community colleges; (2) merit-based financial support; (3) an interdisciplinary freshman curriculum in which students explore theme-based interdisciplinary scientific issues and develop, propose and carry out experimental research projects of their own design; (4) a bridging program for sophomore and transfer students that involves research, teaching, and recruiting opportunities; and (5) a unique residence opportunity through the STEP Living Learning Community. Measures of retention components of our program remain strong. For example, relative to a comparison cohort (those who were invited but chose not to participate in STEP), STEP students declare STEM majors to a greater extent and have higher average GPAs. New recruiting initiatives, which are collaborative with the CWU Office of Admissions, have been one focus of our activities this year. In late summer 2010, STEP and Admissions hired a new recruiter who specifically focuses on central Washington high schools, many of which have large underserved populations of Hispanic and Native American students. The recruiter is bilingual in Spanish and English, is an alumna from CWU (B.S. Chemistry, minors in Biology and Mathematics), and grew up in the central Washington region that is the focus of our current recruiting efforts. She frequently meets with students and families to provide information about STEP and facilitates applications to CWU and STEP. She is also developing long-term relationships with high school teachers and counselors that will enhance the reputations of the university and STEP. For the transfer program, the primary recruitment strategy is a long-term effort to build relationships with individual faculty, advisors, and administrators at regional community colleges with a high potential for STEM students transferring to CWU. The primary goals of these recruiting programs are to enhance participation in STEP by underrepresented students and to increase visibility of CWU to high school and community college transfer students, thereby enhancing the number of students who successfully graduate with STEM degrees.

Poster #: 1 - 09

Session: C

Lead Institution: **University of Utah**

Authors: **Cynthia Furse**
Karen Krapcho

| | | | | | |
|-------------|---------------------|---------------|---------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Engineering | Year 4 | Type 1 | 0652982 | UT |

Poster Title: **Utah's Engineers: A Statewide Initiative for Growth**

Keywords: **Recruitment, Peer Mentoring, Career Counseling**

Poster Abstract: For several decades, college student retention research has focused on the importance of engaging college students in their higher education environment as a tool for helping them attain their degrees. Student Affairs administrators across the United States have incorporated the idea of engagement in their programs and services to increase student retention. This paper describes how the College of Engineering at the University of Utah has incorporated the concept of engagement into its retention efforts in response to a shortage of engineers in the state.

University of Utah engineering students are involved in an interdisciplinary, five-year NSF grant aimed at increasing the recruitment and retention of engineering students at the University. Students are involved in departmental outreach teams that visit local high schools to increase awareness about engineering as a major and career field. Outreach teams develop demonstration projects which are presented to high school students across the state. The outreach team concept allows students to develop close mentoring relationships with faculty and to work with peers in ways that support their academic success. Additionally, talking to high school students about the benefits and challenges of majoring in engineering allows college students to learn more about their own department as well as the College of Engineering generally. Because the teams also include students from Salt Lake Community College (SLCC), the program also provides a smoother transition for students who transfer into the College of Engineering from SLCC. College students also facilitate a summer camp experience for high school students, engaging them in hands-on projects and teaching them basic engineering concepts. Working in teams provides opportunities for academic and social growth both for college students and high school students. These programs are all based on empirical college student retention research, which focuses on engaging students both academically and socially to enhance their college experience. Additional retention efforts include more effective advising, tutoring, and a service learning program that spans departments and years. Tutoring and service learning provide students the opportunity to interact socially around their academic interests, as well as to connect the concepts they learn in class to a more practical setting. Efforts to improve advising enhance students' academic careers. This paper will present continued findings from both quantitative and qualitative data exploring the ongoing impact that involvement in the outreach teams and other retention efforts is having on students' commitment to and attainment of Bachelors' degrees in engineering fields. Outreach team members complete surveys regarding their experiences on a regular basis, and are interviewed annually to learn more about the impact of the program on their academic and career plans. The paper will focus on the first three years of the program, highlighting lessons learned and how that information has been used to improve the program. Additional highlights of the past year include strengthening of a 2yr/4yr partnership with Salt Lake Community College and workshops for high school guidance counselors.

Poster #: 1 - 10 Session: A Lead Institution: **Louisiana Tech University**

Authors: **James Nelson**
Kelly Crittenden
Galen Turner
Jane Petrus

| | | | | | |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | All STEM | Year 4 | Type 1A | 0622462 | LA |

Poster Title: **LaTechSTEP: Louisiana Tech’s STEM Talent Expansion Program**

Keywords: **Recruitment, Math Preparation, Learning Communities, Introductory Courses**

Poster Abstract: Louisiana Tech’s STEM Talent Expansion Program (LaTechSTEP) has two major components designed to increase the number of STEM graduates. A high school partnership program focuses on recruiting new students into our STEM programs, and a freshman enrichment program focuses on increased retention of first-year STEM students.

The recruiting component includes development of partnerships with key feeder high schools. These partnerships have been developed through a series of Teacher Workshops where we build collaborative teams of university faculty and high school teachers. Together we develop engineering and science explorations and design projects for a series of Discovery Weekends for students. Students who participate in this program gain a broader exposure to applications of mathematics and science and will be more likely to choose STEM careers. Teachers learn additional practical applications of the mathematics and science fundamentals they already teach. After three years, the TechSTEP program has directly impacted 9 high schools, 27 teachers, and 160 high school students. Pre- and post-surveys conducted with both students and teachers show increased understanding and interest in STEM topics. In particular, teachers are finding ways to incorporate engineering topics in their math and science classes.

The retention component includes a Freshman Enrichment Program (FrEP) specifically targeted toward students who do not have the math background to immediately begin our Integrated Engineering or Integrated Science Curriculum. To date, FrEP has impacted 181 students (18% of those are female, 19% are minority, and 90% are from Louisiana representing a mix of urban and rural areas). FrEP also includes enrichment topics and academic-year mentoring throughout the freshman year. The program has been very successful in building a cooperative learning community among these students. Retention of FrEP students has been significantly higher than comparable cohorts who did not participate in the program.

Authors: **Mary Fleming-Hughes**
Veronica Arreola
Scott Shippy
Lon Kaufman

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|-------------|---------------------|----------------|----------------|----------------|-----------|
| PhD | All STEM | Year 5+ | Type 1A | 0525582 | IL |

Poster Title: **ASCEND Scholars Program**

Keywords: **Recruitment, Math Preparation, UG Research/Internship Opportunities, Learning Communities, Underrepresented Students**

Poster Abstract:

The Assuring STEM Credential Expansion through Nurturing Diversity (ASCEND) Scholars Program supports selected students from the time they graduate high school until the end of their first year of college through a variety of academic and social activities and partnerships with four Support Units, African American Academic Network (AAAN), Latin American Recruitment and Educational Services (LARES), Minority Engineering Recruitment and Retention Program (MERRP) and Women in Science and Engineering (WISE).

Now in its sixth and final year, ASCEND has run an effective summer bridge and first year program for five cohorts of incoming freshmen with majors in the natural and physical sciences in the College of Liberal Arts and Sciences and the College of Engineering by creating a learning community for STEM majors and promoting undergraduate research at the university. Five cohorts have participated in the ASCEND Scholars program: 2006: n = 34, 2007: n = 44, 2008: n = 43, 2009: n = 32 and 2010: n = 46 for a total of 199 students.

A learning community was established for all five cohorts with the ASCEND five-week summer research component providing an introduction to college life and the rigorous study of STEM disciplines with an emphasis on mathematics and chemistry. The math workshop's purpose is to sharpen students' problem solving and analytical skills. The majority of students completing the math workshop have placed in a higher level math course based on the instructors' recommendations. Chemistry research introduces students to scientific research, hands-on experience in a laboratory and the dynamics of groups. Group presentations are conducted for both mathematics and chemistry results. Previous cohorts serve as peer leaders to assist in the chemistry lab. In addition, a two-hour session is held to introduce students to the rigorous study at a research institution, time management, study skills and transitioning into college.

The learning community continues into the freshman year with students being clustered in chemistry courses and a 10 week seminar course that focuses on learning requirements for graduation with a STEM degree, identifying services and resources to enhance their college experience, identifying careers available to their chosen majors, selecting possible research faculty and forming study groups. Each of UIC's STEM departments, Support Units, the Colleges of Engineering and Liberal Arts and Sciences present on relevant information. In addition, Lon Kaufman presented at each seminar course since 2006 and provided research opportunities for students. Scott Shippy prepared students for scientific research for the spring semester.

During the spring semester, the learning community offered independent research under the supervision of a tenure track faculty member and bi-weekly group meetings. Some students participate in research with a distinguished faculty in several disciplines (biological sciences, medicine, pharmacy, psychology, etc). The bi-weekly group meetings are conducted by ASCEND staff to discuss research methods and other topics of interest to the students. The majority of students are still conducting research and some have conducted research at other institutions (University of Chicago).

The program had twenty-one students (Cohort 1 and Cohort 2) graduate with STEM degrees in May 2010. Some of these students are currently enrolled in graduate or professional school (medical, pharmacy, and optometry). The remaining students in Cohort 2 and some Cohort 3 are graduating May 2011 (approximately 20). A few students have changed their majors to non-STEM disciplines while the others are on track to graduate with STEM degrees in four to five years.

ASCEND expanded the full learning community for STEM students through its partnerships with four of UIC's student recruiting, retention and support units; AAAN, LARES, MERRP and WISE and general programming activities such as open houses, mailings to all incoming freshmen, the Guaranteed 4.0, field trips, guest speakers, math study and chemistry review, back-to-school kick-off, and spring semester jam and collaboration among our Support Units.

Through these broader activities the ASCEND program has been associated with an increase in the number of STEM majors in a given class within UIC. From our pre-program baseline in 2005 we have seen a 60% increase in the number of STEM majors persisting/continuing at UIC. For example, in 2005 an entering class of 767 STEM majors (356 women and 203 under-represented minorities), 453 (59%) persisted to their third year as a STEM major (213 (59%) women and 96 (47%) among underrepresented minorities). In contrast, the 2007 entering class (the second year of ASCEND) enrolled 1242 STEM majors (606 women and 316 underrepresented minorities) led to 694 (56%) third-year STEM majors (337 (56%) women and 151 (48%) underrepresented minorities).

We thank the National Science Foundation for funding the ASCEND Scholars Program at University of Illinois at Chicago.

Authors: **Pamela McElroy Brown**
Estela Rojas
Sunghoon Jang
AE Dreyfuss

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|------------------|---------------------|----------------|----------------|----------------|-----------|
| Bachelors | All STEM | Year 5+ | Type 1A | 0622493 | NY |

Poster Title: **New York City College of Technology (City Tech) - CUNY, Metropolitan Mentors Network (MMNet): Growing an Urban STEM Talent Pool Across New York City**

Keywords: **Supplemental Instruction, Learning Communities, Underrepresented Students**

Poster Abstract: Background: City Tech is a comprehensive college, offering both associate and bachelor's degree programs. Our NSF STEM grant is helping us to achieve our goal of increasing the number of students receiving degrees within science, technology, engineering, and mathematics through:

- Development of two credit-bearing, pre-freshman summer bridge courses (one in the sciences and math, the other in engineering technologies), providing academic preparation through a combination of theory and hands-on experience, and trips to local industries and government labs to provide career information.
- Promotion of academic support and student involvement on campus, through expansion of peer-led team learning, learning communities, research opportunities and career oriented activities. One unique component of our program is that City Tech alumni, currently in graduate school, work as teaching assistants and mentors to current undergraduates, while they themselves receive mentoring from our STEM faculty.
- Development of literature and strategies to promote recruitment. Dissemination of results through the project web page and presentations at regional and national conferences.

Implementation: Summer bridge courses: Enrollment was 22 in summer 2007 and 36 in 2008, 31 in 2009, and 43 in 2010, evidence of improved recruitment.

Summer 2007, 2008, 2009 bridge cohorts: (1) One-year retention surpassed the college average for first-time freshmen in bachelor's programs associate programs and overall. (2) One-year same program retention exceeded the college's average one year same program retention for first-time freshmen in bachelor's programs and associate programs. This suggests that knowledge about majors and career options before the start of the freshman year decreased changes in majors, which could lead to loss of contributory credits and disenchantment. Fall 2009 institutional data on one-year retention is not yet available.

Promotion of academic support and student involvement

- Over 100 students presented their research at the spring 2009 City Tech research poster presentation, up from fewer than 20 prior to the grant period. Some students have presented at national conferences. Many more students are also presenting at regional and national conferences.
- Four City Tech graduate students serve as teaching assistants and mentors for about 100 students each semester
- Peer-led team learning has been expanded to six courses in math, two in chemistry, one in physics, one in biology and one in developmental writing (previously just one math course), with a structure for student and faculty training in place. Learning communities are being expanded to STEM disciplines.

Successes

- STEM enrollment increased by 391 students (11.5%) in three years (2005-6 to 2008-9)
- STEM bachelor's degrees increased from 203 in 2005-6 to 226 in the same 3-year period.

Poster #: 1 – 13 Session: A Lead Institution: **University of Cincinnati – Main Campus**

Authors: **Anant Kukreti**
Marlo Thigpen
Kenneth Simonson
Urmila Ghia
Jeffrey Johnson

| | | | | | |
|------------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Bachelors | Engineering | Year 3 | Type 1A | 0756921 | OH |

Poster Title: **"Enhancing Recruitment and Retention of Undergraduate Engineering Students"**

Keywords: **Recruitment, Math Preparation, UG Research/Internship Opportunities, Supplemental Instructions, Learning Communities, Underrepresented Students**

Poster Abstract: The University of Cincinnati’s (UC) College of Engineering and Applied Science and Applied Science (CEAS) is committed to: Increasing and retaining to completion the number of female and underrepresented minority students in the fields of Engineering and Computer Science; and creating the best environment for studying and performing engineering research so that these students become well-prepared for the rigors of graduate education and obtaining the best jobs in a global economy. Because of this commitment, the goal of this Type 1 STEP project are: to increase and retain to completion the number of women and underrepresented minority students in the fields of Engineering and Computer Science in the College of Engineering and Applied Science (CEAS) at the University of Cincinnati (UC), and to create the best environment for studying and performing research, so that they become well prepared for graduate education and the rigors of the ever-changing global market. To achieve the above goal, the objectives of the project are: 1) Develop Grade 4-12 pathway activities to build a steady supply of students interested in engineering. 2) In five years, relative to UC’s fall 2008 enrollment, increase the percentage of female (non-minority and minority) engineering students from 16% to 24% of all freshmen engineering students in five years. 3) In five years, relative to UC’s fall 2008 enrollment, increase the percentage of minority (female and male) engineering students from 6% to 12% of all freshmen engineering students in five years. 4) In five years, relative to spring 2008, graduate 74% of students from these targeted populations in five years. 5) Achieve the above enrollment targets for underrepresented engineering students to begin bringing UC's CEAS into parity with the number these groups represent in the State of Ohio. 6) Upon graduation, place 100% of these targeted students in technical jobs or graduate school; and 7) Develop a pathway program that encourages and prepares underrepresented engineering students to compete for graduate school admission and financial support as well as succeed in graduate school.

The key activities of our NSF Type 1 STEP grant are our Summer Bridge Program, Supplemental Cooperative Learning Courses (SCLC’s), Blacks in Science Course, Learning Community (LC) Course, and the Advisory Component. These activities have had the greatest impact on our project and the University as many of these activities have been adopted by the University or the college. These are also the activities within the grant that we have direct control over and can monitor close up. As previously mentioned, one goal of the project is to increase and retain to completion the number of women and underrepresented minority in the fields of Engineering and Computing Science. To date the project includes 57 underrepresented men and women and 39 majority women. Thus a total of 96 participants have participated since the inception of the nprogram 2008. Academically, STEP students have performed much better than their non-project peers. The data for Years 2 & 3 show a retention rate for the STEP students over 80%, which is greater than the 74% average for UC CEAS engineering students. Despite our successes in the retention area, additional efforts and strategies are needed to increase the recruitment yield of ethnic underrepresented students into the Summer Bridge Program. The summer outreach programs (IS & FSA) have been well received and should be continued and leveraged more to enhance this yield.

Poster #: 1 - 14 Session: B Lead Institution: Texas A & M University -- Type 1B

Authors: **Don Allen**
 Jeff Froyd

| | | | | | |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Math | Year 2 | Type 1B | 0856767 | TX |

Poster Title: **Retention through Remediation: Enhancing Success in Calculus I**

Keywords: **Math Preparation, Service Learning, Student Tracking**

Poster Abstract: Texas A&M University is a large state land grant university with an engineering program with more than 5,000 majors. For many years now there has been a less than desirable calculus success rate for incoming majors. The principle cause surrounds their mathematics preparedness, particularly with algebra skills. Our STEM 1B project seeks to use an array of technology-mediated strategies to identify new STEM students who are weak in pre-calculus/algebraic skills (and hence are at high risk of doing poorly in Calculus I) and then to intervene to strengthen those skills before and during their first college semester. Using the results from a Calculus Readiness Assessment developed on Texas A&M's STEP 1A project, we propose to identify incoming students who are mathematically at risk, providing to each student a technology-mediated Personalized Study Program (PSP) of highly focused mathematical tasks to strengthen their pre-calculus skills and position them for success in college mathematics. This individualized program of study will be delivered to the student before attending college, while they are still at home during the summer, and will be mediated via four principal technologies: (1) Conferencing software for direct synchronous contact with an experienced instructor; (2) Videos of importance topics in pre-calculus and solved problems; (3) Applets to enhance student visualization abilities and for added interactivity and depth of understanding; and (4) An online course management system to monitor the student's progress through the PSP. Complementing the PSP will be the "Just-in-Time" fall program, which will reinforce algebraic concepts as they are needed in the Calculus I course. When fully operational this project will impact at least 600 of the incoming 3,100 STEM students in both the summer intervention and the fall Just-in-Time program. It is anticipated that it will increase success in Calculus I and Calculus II by 15% and overall STEM graduation rates by at least 6% resulting in at least 100 additional STEM graduates annually. The intellectual merit rests with the spectrum of new knowledge about the remediation of algebraically weak students prior to exposure to the collegiate environs but after their high school experience. It is a bridging-type program. It will allow the tracking of students with a new option of obtaining additional mathematics experience in a non-credit, non-threatening learning community environment while pursuing a personalized study plan. A large amount of highly useful data will be collected through the online interface as well as through program assessment efforts regarding student learning and study behavior. The team producing the materials has individually and collectively been involved in numerous large scale technology-mediated projects from professional development, to course remediation, to high school technology projects, to applet and course management system development. The broader impacts of this proposal include an effective and cost-effective remediation program in pre-calculus available to large numbers of students who need it, prior to taking Calculus I. This, in turn, will increase success rates for Calculus I and II, which are de facto STEM-gateway courses. Furthermore, because underrepresented students often leave STEM fields in higher numbers, increasing retention will likely increase the diversity of STEM graduates. The products generated under this grant will be turn-key software-content packages available to all campuses and would also be licensable in the commercial sector. This model for remediation-prior-to-college may well become an important standard for collegiate success by giving students on the brink of their collegiate experience a realistic assessment of the skills they need to succeed in calculus and offering to them a high quality program personalized to their precise needs. This program will eventually be self-supporting, and with scholarships available, it may be especially suited to students in need, enhancing and encouraging a diverse population of potential STEM students.

Poster #: 2 - 01 Session: A Lead Institution: **California State Polytechnical University - Pomona**

Authors: **Edward Walton
Winnie Dong
Barbara Burke**

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 1 | Type 1A | 0969520 | CA |

Poster Title: **Cal Poly STEP: Three Strategies to Improve STEM Graduation Rates**

Keywords: **Peer Tutoring, Introductory Courses, Institutional Change**

Poster Abstract: Cal Poly Pomona is one of only six polytechnic universities in the country and attracts a large, diverse student body to its well-regarded science and engineering programs. Cal Poly Pomona has no problem attracting students to STEM majors...the difficulty is in keeping them!

This STEP project “Three Strategies to Improve STEM Graduation Rates” employs research-based methods and proven strategies that Motivate, Nurture, and Engage students with the goal to have both higher graduation and retention rates by STEM Students.

A recent report found that California ranked first in the nation in the amount of taxpayer funds spent on students at four-year colleges who failed to return for a second year. California spent nearly half a billion on college freshmen who later dropped out. For First Time Freshmen who enter Cal Poly Pomona in STEM disciplines, only 28.7% persist and graduate as STEM majors within six years.

This work is redesigning our calculus, chemistry, and physics courses, enhancing our first year experiences courses, and offering apprenticeships to STEM students in order to increase the retention rate of participating STEM students by 50%, and improve their academic performance.

Our Course Redevelopment targets course strategies that include more interactive teaching and learning. The Enhanced First Year Experiences will offer all STEM students innovative orientation courses that will promote community, engage them in problem-solving activities, stimulate their interest in STEM careers, and facilitate the learning of college survival skills. Our Apprenticeships/Professional Development Opportunities will involve students early in their major, and establish relationships between them and other STEM students and faculty, so as to bring them into the scientific community.

Poster #: 2 – 02

Sessions: B

Lead Institution: **Morehouse College**

Authors: **Lycurgus Muldrow**
Alicia Paul Thomas
Knox Phillips

| | | | | | |
|------------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Bachelors | All STEM | Year 3 | Type 1A | 0756918 | GA |

Poster Title: **Enhancing Success in STEM by Building Skills and Intervention**

Keywords: **Math Preparation, Supplemental Instruction, Introductory Courses, Program Evaluation, Underrepresented Students, Institutional Change**

Poster Abstract: The NSF STEM Talent Expansion Program (STEP) at Morehouse College aims to increase the retention rate of science, technology, engineering and mathematics (STEM) students. The first major retention activity involved creating a Scientific Literacy course for at-risk STEM freshmen. The Scientific Literacy course sequence is being offered for the second year and preliminary evidence providing intermediate measures of success indicates up to a 33.3% increase in retention in the STEM major of second-semester sophomores who completed Scientific Literacy vs. a control group. Students enrolled in the Scientific Literacy course report a better understanding of the nature of research, and an enhanced ability to evaluate scientific evidence and participate in scientific reasoning. The second major project activity included the creation of a comprehensive support program for all STEM majors in the Division of Science and Mathematics. The comprehensive support consisted of: first; creating a STEM Cyber Village that has received over 6,000 hits during the first 14 months; second, establishing an environment in which students discover through experience the added value of team learning by involving over 400 participants in team learning activities; and third, implementing faculty development and program collaboration activities which included two workshops/presentations from external speakers, and regularly scheduled collaboration meetings. As it relates to the comprehensive support program and the Scientific Literacy courses, the planned programmatic activities of this STEP grant are being accomplished in alignment with the targets of the original proposal.

Authors: **Pamela Lockwood**
Ray Matlack
Emily Hunt

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|-----------------|---------------------|----------------|---------------|----------------|-----------|
| Two Year | Science | Year 5+ | Type 1 | 0525370 | NY |

Poster Title: **Step Phase I: Increasing Numbers, Connections, and Retention in Science and Engineering (INCRSE)**

Keywords: **Learning Communities**

Poster Abstract: Increasing Numbers, Connections, and Retention in Science and Engineering (INCRSE) at West Texas A&M University (WTAMU) is a type I Science, Technology, Engineering, and Mathematics Talent Expansion Program. This program focuses on increasing the quantity, quality, and diversity of STEM majors at WTAMU through recruitment and retention strategies. INCRSE has impacted over 1000 STEM majors in 4.5 years through learning communities in gateway STEM courses and redesigned science laboratories. Redesigned introductory biology laboratories were implemented in fall 2008. Student focus groups indicated perceived improvements in many areas including student engagement and understanding of biology concepts. Calculus and engineering courses are linked by enrollment and Problem-Based Learning is used to integrate course objectives and promote student learning and engagement. Additional learning communities have been formed linking Chemistry I and a freshman seminar course. This first-year learning community has shown dramatic results in student retention and success when compared to non-learning community freshman enrolled in Chemistry I. The INCRSE goal of increasing the number of STEM majors by 25% over five years was exceeded in only three years with a current 40% increase in new STEM majors; the university enrollment increased by only 10% during this time. This success has been achieved in part through the development of relationships between INCRSE faculty and faculty at regional community colleges. Community College (CC) transfer of STEM majors increased by 11% during the first four years of INCRSE; university CC transfers dropped by 5.6% during this period.

Poster #: 2 - 04 Session: C Lead Institution: **Eastern Michigan University**

Authors: **Ellene Tratras Contis**
Kathleen Stacey
Claudia Petrescu

| | | | | | |
|----------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 5+ | Type 1A | 0525514 | MI |

Poster Title: **Creative Scientific Inquiry Experience: Developing Integrated Science Curriculum to Increase STEM Graduates**

Keywords: **Learning Communities, Service Learning, Introductory Courses, Faculty & Staff Development**

Poster Abstract: The Creative Scientific Inquiry Experience (CSIE) Program focuses on increasing the number of STEM graduates. This program uses an innovative approach that includes faculty professional development, student connectedness to STEM through academic service-learning (AS-L) and curricular reform. CSIE Faculty Fellows are energizing their teaching through development of CSIE experiences—successfully helping students make connections between core courses, and with their faculty, peers, and community partners. The CSIE Program, now in its sixth year, encourages the building of learning communities among faculty, students, and local non-profit organizations. The structure includes theme-linked clusters of two STEM courses plus a one-credit hour CSIE seminar that features an AS-L or community-based research experience. Faculty identify interdisciplinary connections, create a relevant theme, and provide academic service-learning experiences and research activities that serve both course content and the needs of a local non-profit. The seminars are team-taught by the faculty from the core STEM courses. Students enroll in the cluster of courses and enjoy the benefits of intensive faculty interaction, research-based experiences, smaller class sizes, convenient scheduling, and the CSIE Books-on-Loan Program. CSIE Program enrollment is open to all students who meet the prerequisites for the core STEM courses—there are no additional restrictions. From Fall 2006 through Winter 2011, over 400 students have taken part in the CSIE Program at Eastern Michigan University. Eighteen CSIE seminars have been created by 38 faculty—with six CSIE clusters (the combination of two core STEM courses anchored by the CSIE seminar course) institutionalized into the regular annual academic schedules. In addition, the findings presented on the poster address how each component of the CSIE Program has influenced students' persistence within STEM programs.

Poster #: 2 - 05

Session: B

Lead Institution: **Sweet Briar College**

Authors: **Hank Yochum**
Scott Pierce
Bethany Brinkman

| | | | | | |
|------------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Bachelors | Engineering | Year 5+ | Type 1A | 0525388 | VA |

Poster Title: **Increasing the Representation of Women in STEM via a New Interdisciplinary Engineering Program at a Liberal Arts Womens College**

Keywords: **Recruitment, Service Learning, Underrepresented Students**

Poster Abstract: Sweet Briar College, a small liberal arts college for women in Central Virginia, initiated new degree programs in Engineering Science and Engineering Management in the fall of 2005. Our STEP project objective is to increase the number of women in engineering at Sweet Briar through recruitment and retention initiatives.

Our STEP project consists of several elements including scholarships, internships with area industry, and an intensive recruitment effort. In an effort to increase the number of high school students that visit our campus and that have significant interaction with our engineering students and faculty, we have added academic year, overnight Explore Engineering events to our project. At these events, female high school students work with faculty and current students on a hands-on engineering project. Since the fall of 2008, we have held six academic year weekend overnight events and two summer weeklong residential course for college credit. Reviews of the events have been very positive and several high school students have attended more than one event. Each event has an average of 17 participants. At these events, a strong effort is made to effectively communicate the nature of engineering to girls with market-tested language, emphasizing creativity and the way engineers make a difference in the world, etc.

We also offer two new engineering courses (Technology and Society: A Global Perspective and Technology and Society: A Regional Perspective) that are focused on engineering projects that help people. In the first global course, students solved water supply problems for a school in the mountains of Guatemala (spring 2007). As part of the regional course, students solved engineering problems for disabled workers at a local light manufacturing facility (spring 2009). One student team won third place in the National Scholar Award for Workplace Innovation and Design. In our current (spring 2011) global course, students are designing assistive devices for a hospital in Brazil, in collaboration with the engineering program at St. Ambrose University (former STEP grant awardees).

Recruiting women students to a relatively new engineering program at a women's college continues to be a significant challenge.

Authors: **Jose Giraldo**
Cherie McCollough
David Grise
James Silliman

| | | | | | |
|-------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Science | Year 5+ | Type 1A | 0622530 | TX |

Poster Title: **TAMU-CC STEP-Recruitment, Retention, and Success in Science (R2S2)**

Keywords: **Math Preparation, Learning Communities, Introductory Courses**

Poster Abstract: Texas A&M University Corpus Christi (TAMUCC) is a Hispanic Serving Institution (HIS) with a student body of over 10,000 students. The STEP program at TAMUCC is currently on its fifth year and its main goal is to increase the retention and graduation of STEM students who start as freshmen. The majority of STEP students enroll in biology, chemistry, English, the first year seminar, and one mathematics course (college algebra, precalculus, or calculus I), as part of the Science Learning Community. A team representing mathematics, chemistry, biology, and science education disciplines manages the program.

From fall 2007 to spring 2011 a total of 389 freshmen STEM students have participated in the program, of which 35.7% are Hispanic and 48.8% white. From the 2007, 2008, and 2009 freshmen in the program the percentage of students going into the second year is over 73% each year, while the percentage of students going into the third year (first two years of the program) is above 63%, numbers which surpass the university retention rate by at least 10%.

The STEP program offers a curriculum driven by relevance, rigor, problem-based learning, and active student participation. In addition to the implementation of best teaching and learning practices, there is a peer-mentoring component to support the STEP student. The undergraduate peer mentors provide assistance outside the classroom as well as in the regular class meeting while students are working on collaborative activities. The demand for peer mentoring has increased dramatically in the STEP program. In the academic years 2008-2009 and 2009-2010 consistently above 80% of the students have attended at least one mentoring session in mathematics and above 90% have attended at least one mentoring session in biology. However, the attendance to mentoring in chemistry is between 50% and 60%.

Overall the STEP students enrolled in the Science Learning Community are performing about 10% higher in the math class than the other students taking a similar math class. In addition, the success in the math component seems to be a strong indicator for success in the science courses. About 85% of the students who made C or better in precalculus and calculus also made C or better in both biology and chemistry. It is also observed that the precalculus and calculus I student perform higher than the average student in the science classes by almost a full letter grade, while the college algebra students performed about the same as the average.

It is projected that about 52% of students in Cohort I (2007-2008) will graduate in five years or less. This number is similar to the overall graduation rate of TAMUCC. However, it is projected that about 62% of students in Cohort II (2008-2009) will graduate in less than five years, which is about 10% more than the university graduation rate in the same period.

Poster #: 2 - 07

Session: A

Lead Institution: **Wright State University**

Authors: **Nathan Klingbeil**
Kathy Koenig
George Sehi
Richard Jones

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|-------------|---------------------|----------------|----------------|----------------|-----------|
| PhD | All STEM | Year 5+ | Type 1A | 0622466 | OH |

Poster Title: **Gateway into First-Year STEM Curricula: A Community College/University Collaboration Promoting Retention and Articulation**

Keywords: **Math Preparation, Introductory Courses**

Poster Abstract: This project is a collaboration between Wright State University (WSU) and Sinclair Community College (SCC) to develop a common first-year STEM experience, which aims to increase first-to-second year retention at both SCC and WSU, as well as articulation of STEM majors from SCC to WSU. While STEM attrition is a problem throughout the 4-6 years of college study, the first-year experience (FYE) is most critical to retention of students in STEM disciplines. The primary barrier to success in Engineering/Technology is the traditional “gateway” calculus sequence; the barrier to success in Science/Mathematics is general innumeracy and scientific illiteracy. Prior NSF support of WSU’s National Model for Engineering Mathematics Education has shown that the introduction of EGR 101 “Introductory Mathematics for Engineering Applications,” coupled with a significant restructuring of the early engineering curriculum, has significantly increased first-to-second year retention, as well as student motivation and confidence in math and engineering. Based on this prior success, the current NSF STEP initiative will: 1) Implement EGR 101 and the associated engineering curriculum reforms at SCC. 2) Develop a companion lab-based class for science majors (Scientific Thought and Method), SM 101/ASE 101, for instruction at both WSU and SCC. 3) Provide professional development opportunities for faculty at both institutions. 4) Train STEM seniors/graduate students to serve as lab/recitation assistants and peer tutors for any introductory STEM classes. 5) Disseminate the curriculum and associated first-year experience. The above educational treatments will make the curriculum substantially more accessible to all incoming students, and particularly to those who have been historically underrepresented in STEM. Resulting increases in retention and articulation are expected to yield 50 additional STEM graduates per year by the close of the project. This model is intended to be readily transferable to other metropolitan university/community college dyads with comparable open admissions policies.

Poster #: 3 - 01

Session: A

Lead Institution: **Rutgers University - Camden**

Authors: **Joseph V. Martin**
Robert Evans
Sunil Shende
Daniel Bubb
Alex Roche
Joseph Gerver

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Masters | All STEM | Year 1 | Type 1A | 0856435 | NJ |

Poster Title: **Q-STEP Community of Quantitative Scientists**

Keywords: **Math Preparation, Peer Tutoring, Peer Mentoring**

Poster Abstract: The faculties of the science and mathematics departments in the Camden College of Arts and Science at Rutgers University have instituted a new program to enhance the retention and successful graduation of science, technology, engineering and mathematics (STEM) majors. Part of the NSF STEM Talent Expansion Program (STEP), the Rutgers program is named Q-STEP to underscore a heavy emphasis on the enhancement of student quantitative skills.

A major objective of the Q-STEP program has been the formation of a non-residential community of scholars for the predominantly commuter campus. The Q-STEP community provides a supportive social network, increased chances for group study and problem-solving and peer tutoring. In March 2010, the renovation of a dedicated space for the campus home of the Q-STEP community was completed. This facility, open to the students from 7 AM-10 PM, provides secure storage of personal items for the students along with study and meeting areas and internet access. Two distinct groups of students are involved in the program. Q-STEP Scholars were recruited as freshmen, while Q-STEP Mentors are advanced students (in their junior year). Q-STEP Scholars are encouraged to follow similar class schedules and are mentored and tutored in weekly meetings with the Q-STEP Mentors. In addition, all participants have a weekly meeting together. In this meeting, the Q-STEP faculty members make presentations (on career opportunities, for example) or pose a quantitative problem for the students to solve in workgroups. Last summer a selected group of Q-STEP Scholars were supported to work in research laboratories of the Rutgers-Camden faculty. At the beginning of the new academic year, the student researchers presented the results of their work to a day-long meeting of the new and continuing Q-STEP participants. An additional objective of the Q-STEP program is a concerted effort of all of the science and mathematics departments to re-examine the undergraduate curriculum. A primary current goal of these meetings is to design a new interdisciplinary major in Computational and Integrative Biology.

Poster #: 3 - 02

Session: B

Lead Institution: **Northern Kentucky University**

Authors: **Teri Murphy**
Maureen Doyle

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Masters | All STEM | Year 1 | Type 1A | 0969280 | KY |

Poster Title: **FORCE: Focus on Occupations, Recruiting, Community, and Engagement**

Keywords: **Recruitment, Peer Tutoring, Peer Mentoring, UG Research/Internship Opportunities, Supplemental Instructions, Learning Communities, Career Counseling, Introductory Courses**

Poster Abstract: This STEP Type 1A project is in its first year. The project is STEM-wide, with an emphasis on balancing discipline and department cultures with implementing system-wide processes where they make sense.

Project activities that began this first year:

- deliberate and pro-active Linked-In-STEM activities, pushing horizontal and vertical networking through events and web-based social networking tools;
- a cadre of STEM Ambassadors, undergraduates who represent the STEM disciplines as peer tutors, recruiters, and emissaries at events;
- Personal Invitations, to date in the form of letters, to potential majors to consider a STEM degree path; and
- undergraduate research opportunities, dubbed U-R-STEM, restricted to students who have not yet participated in research, with the hope of getting them involved sooner (e.g., rising sophomores).

Project activities that will begin in project year 2:

- a Learning Community targeting pre-calculus students and centered around a new course introducing students to a breadth of STEM degree and career trajectories and
- the expansion of a STEM residential learning community initiated by a S-STEM grant (PI Haik, NSF DUE award #0806915).

The selection of activities is based largely on research results in Tinto (1993), Braxton (2000), Seymour and Hewitt (1997), and Murphy, Shehab, Rhoads, et al (2007). Specifically, this project is an effort to adapt to NKU some of the findings from the ethnographic study, *Why Does It Work? A Study of Successful Gender Equity in Industrial Engineering at the University of Oklahoma* (NSF GSE award 0225228, PI Murphy).

Authors: **Michael Vitale**

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|-----------------|---------------------|---------------|----------------|----------------|-----------|
| Two Year | All STEM | Year 1 | Type 1A | 0968970 | FL |

Poster Title: **STEM Community Scholars Program**Keywords: **Peer Tutoring, Peer Mentoring, Underrepresented****Poster Abstract:** The STEM Community Scholars Program is designed to meet the following objectives:

1. Increased enrollment in STEM programs by 50 students annually.
2. Impact graduate rates both in the program and across the STEM disciplines.
3. Assist 80% of participants in applying to a STEM baccalaureate program.
4. Institutionalize project activities by the conclusion of the project.
5. Conduct a comprehensive evaluation of the implemented strategies.

To accomplish these objectives, we are targeting two-year students from our Associate of Arts degree program with an emphasis on recruiting students who are member of groups traditionally underrepresented in STEM fields. The program will be an intensive learning community based on best practices in student retention, persistence, and completion. These will include setting high expectations, continual and intrusive academic advising, creating strong social ties, providing limited financial assistance and transfer assistance. Peer tutoring and peer mentoring will be an important part of this project.

Students will have opportunities to visit businesses and universities in Florida. Taking the students to STEM oriented business gives them the opportunity to see the types of work done by STEM graduates and to meet with and discuss job opportunities with individuals working in the STEM fields. By visiting the universities, the students will be exposed to undergraduate and potential graduate opportunities that are available to them.

Poster #: 3 – 04 Session: A Lead Institution: **Boise State University**

Authors: **Janet Callahan** **Joe Guarino**
 Jude Garzolini **Gary Hunt**
 Doug Bullock **Susan Shadle**

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 2 | Type 1A | 0856815 | ID |

Poster Title: **The Idaho Science Talent Expansion Program**

Keywords: **Math Preparation, UG Research/Internship Opportunities, Learning Communities, Faculty & Staff Development**

Poster Abstract: In the first year of the Boise State University Idaho STEP program the most significant overarching achievement was heightened campus awareness of the enormous growth in STEM majors. A 32% increase in STEM enrollment arose between fall 2006 and fall 2010 that created a major opportunity to increase the number of STEM graduates. However, this growth created unmet need in terms of course offerings, course staffing, laboratory facilities and more. This program focused attention on all STEM students, creating a focal point for their needs.

In year one, the following six activities were implemented: (1) a joint STEM summer orientation was held that integrated the science and mathematics majors with the engineering majors; (2) an expansion of the student learning community (SLC) offerings to all STEM majors occurred; (3) a General Sciences course was created for STEM students who are underprepared in mathematics; (4) a free, elective, non-credit bearing mathematics online review course, ALEKS®, was made available to STEM students entering the university; (5) a Faculty Learning Community, the inaugural cohort of eight STEM Teaching Scholars, was organized; and (6) the first STEP undergraduate researcher cohort was formed. Assessment of these first-year activities created numerous plans to leverage their success in year two.

An unforeseen result of the focused attention on STEM orientation, learning communities and freshmen experiences was a heightened awareness across multiple university entities of unmet course availability in lower division science and math service courses. A major opportunity that arose relates to improved university registration procedures for incoming STEM majors and changes in how the university defines the number of seats available during registration. The leadership team found it to be effective to use the Idaho STEP internal/external advisory committee meetings as a forum to identify and promote institution-wide solutions to issues encountered.

Efforts in year two are focused on enculturation aspects, as the team works to build a culture that supports new students into the STEM community. New actions to improve the year one activities will be implemented; a summer bridge program with an outdoor focus to engage incoming at risk STEM majors will be developed; and the STEP activities will be leveraged with complementary STEM community activities and resources.

References:

1 Course based on Koenig, K. (August, 2010). Scientific Thought and Method: Course Manual 2nd Edition Version G. XanEdu Custom Publishing: Ann Arbor, MI.

2 ALEKS is a registered trademark of ALEKS Corporation, www.aleks.com

Poster #: 3 - 05

Session: B

Lead Institution: **Saint Vincent College**

Authors: **Norman Hipps**
Mandy Raab

| | | | | | |
|------------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Bachelors | Science | Year 2 | Type 1A | 0856575 | PA |

Poster Title: **Increasing Enrollment and Retention in STEM at Saint Vincent College (Year 2): Fostering the interdisciplinary majors of Bioinformatics, Biochemistry, and Biochemistry through a Collaborative Learning Program (CLP)**

Keywords: **Recruitment, Peer Tutoring, Peer Mentoring, Supplemental Instruction, Learning Communities, Introductory Courses**

Poster Abstract: Relevant literature on undergraduate STEM education provides recommendations for increasing the success of undergraduate STEM programs. These recommendations include incorporating cross-disciplinary learning strategies, greater and earlier undergraduate participation in research, and a supportive culture into the STEM disciplines. The National Academy of Sciences advocates the incorporation of interdisciplinary approaches to learning into the undergraduate STEM curriculum as a valid strategy for piquing and maintaining the interest of undergraduates by “allowing students to understand the importance of studying what might otherwise seem to be disconnected and unrelated topics” and as a strategy that “invites student involvement and active participation.” Saint Vincent College is addressing the need for an increase in STEM graduation rates through the development of a Collaborative Learning Program (CLP) that combines recruitment and retention efforts and scholarship incentives with an academic support mechanism aimed at reaching out to students through peer learning.

Highlights from the Collaborative Learning Program (2nd Year):

CLP Participation

- 140 out of 233 freshman STEM students participate in our Collaborative Learning Program – which provides supplemental instruction in the CLP high-risk courses of General Biology, General Chemistry, and Intro to Computer Science.
- The CLP program was expanded to include the sophomore level high-risk courses of Organic Chemistry and Cell Biology.
- A Fall 2010 online survey was conducted by the University of Pittsburgh’s Collaborative for Evaluation & Assessment Capacity (CEAC) to assess the efficacy of the CLP supplemental instruction program. The survey elicited a high response rate from students enrolled in one or more of the 5 high-risk courses.
- Student participation increased up to two-fold in our 2nd year of the CLP program. Program updates will be discussed.

STEP Recruitment and Retention

- 6 STEM Scholarships were awarded to incoming freshmen in the interdisciplinary fields of Bioinformatics, Biochemistry and Biotechnology.
- In 4 of the 5 CLP courses, students who attended CLP sessions earned on average, a 15-25% higher grade than those students who did not participate.
- Preliminary assessment of the effect of CLP on student retention is discussed.

Poster #: 3 - 06 Session: C Lead Institution: **University of Houston**

Authors: **Stuart Long** **Allison Swenson**
 Frank Claydon **Diana de la Rosa-Pohl**
 Kathy Zerda

| | | | | | |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Engineering | Year 2 | Type 1B | 0855730 | TX |

Poster Title: **STEP Forward: STEM Talent Expansion Program for Women and Under Represented Group Recruitment and Retention Development at the University of Houston**

Keywords: **Recruitment, Peer Tutoring, Peer Mentoring, UG Research/Internship Opportunities, Learning Communities, Introductory Courses, Underrepresented Students**

Poster Abstract: The major goal of the STEP Forward program is to recruit and retain more students from under-represented groups into STEM areas. Our principal target audience includes females, Hispanics, African Americans and first generation in college students. We are primarily interested in promoting university engineering and science studies and careers among these currently under represented populations. The University of Houston is one of the most diverse urban research institutions in the nation, and thus, has exceptional opportunities to be successful.

The development of a diverse and highly capable, technical workforce is an important objective of our nation. Unfortunately many of today's youth do not recognize the opportunities and rewards of a career in science, technology, engineering, or mathematics (STEM) because they have never met a STEM professional, have no idea what one does, or perhaps perceive that they cannot pursue a STEM degree based on their gender, ethnic background, educational environment, or stage of life. Many young men and women have the skills and qualifications to study in one of the STEM fields, but choose to major in other areas without considering "technical" careers. Furthermore, students who do enter the STEM fields may not succeed, due to insufficient knowledge about how to study effectively or lack of resources to support them throughout their academic careers. For these reasons, the University of Houston has created a retention and recruitment program aimed at increasing the number of students obtaining STEM undergraduate degrees.

The program is built upon and integrated with our previously existing successful undergraduate recruiting and retention programs. New retention efforts have created student groups focusing on activities in their major, undergraduate research opportunities, and two new freshmen project-based courses. The recruiting programs now include a summer camp for 11th and 12th graders, a support system for entering female STEM students, a program for present and future high school math and science teachers, and a freshman level undergraduate research opportunity. We have created an inclusive undergraduate retention and recruitment program that achieves the goals of the STEM Talent Expansion Program for students from the 11th grade in high school through their university graduation.

One of the dominant themes of our proposed strategies has been the inclusion of the research aspects of the University into our retention and recruiting programs. The women's program includes presentations by female faculty members to describe their research efforts. The principal goal of the program for the high school teachers is to acquaint the teachers with the broad range of STEM area research activities going on at the University. The student research groups allow a larger number of undergraduates to learn about discovery based programs in their major field, while the undergraduate research program gives a smaller number of them the opportunity for one-on-one mentored research experiences with our faculty.

Poster #: 3 - 07

Session: A

Lead Institution: **University of Texas
at Arlington**

Authors: **Lynn Peterson
James Epperson
Ramon Lopez
Kevin Schug
Carter Tiernan**

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| PhD | All STEM | Year 2 | Type 1A | 0856796 | TX |

Poster Title: **AURAS: The University of Texas at Arlington Undergraduate Research-based Achievement for STEM collaboration**

Keywords: **Recruitment, Math Preparation, Peer Mentoring, UG Research/Internship Opportunities, Introductory Courses, Underrepresented Student**

Poster Abstract: The University of Texas at Arlington (UTA) is implementing AURAS, the Arlington Undergraduate Research-based Achievement for STEM collaboration, as a combined effort of the Colleges of Science and Engineering to increase retention of incoming first-time first-semester freshmen in these colleges by 15%. The goal of AURAS is to use research-based approaches and best practices to increase the retention of STEM majors, particularly women and other students historically underrepresented in STEM. Specific objectives dovetail to meet this goal, with program components linked to one or more of these objectives.

Objective 1: Pedagogical reform in high-loss courses to provide intensive intervention to target students.

Objective 2: Authentic learning experiences to increase STEM interest and offer financial support.

Objective 3: Discipline-based research and evaluation to verify results and foster long-term change.

Program components include (1) implementation of the recognized best-practice “Emerging Scholars” program in high-loss courses in mathematics (specifically, Precalculus and Calculus I & II) and chemistry (Chemistry for Engineers and General Chemistry) courses, and (2) undergraduate research opportunities (“authentic experiences”) pairing first- and second-year undergraduates with faculty mentors in lab experiences.

The authentic experiences component began in Spring 2010 and the first Emerging Scholars programs in mathematics and chemistry began in Fall 2010. Preliminary data related to the impact of these programs will be reported.

Authors: **Kristen Leckrone**
Sara Compton

Steve Cohen
Donyel Williams

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|------------------|---------------------|---------------|----------------|----------------|-----------|
| Bachelors | All STEM | Year 3 | Type 1A | 0757053 | IL |

Poster Title: **Roosevelt University – Harold Washington College Partnership for STEM Education**

Keywords: **Math Preparation, Peer Tutoring, UG Research/Internship Opportunities, Introductory Courses**

Poster Abstract: The goal of this grant is to significantly and sustainably increase the number of students matriculating in and completing STEM degrees at Harold Washington College (HWC) and at Roosevelt University (RU, through five objectives: (1) STEM-specific recruitment, (2) improved retention through student services and supplementary instruction in core STEM courses, (3) undergraduate research opportunities, (4) scholarships for STEM students, and (5) faculty and curricular development. STEM-Specific Recruiting.

Recruiting includes STEM-specific high school visits, designated STEM admissions and transfer counselors, STEM-specific recruiting materials, and summer camps for high school students. Improved STEM-specific recruiting has increased the number of STEM majors at RU by 9.5% over years 1-3 of the grant, or by about a third of the 30% grant target. We have also increased the percentage of STEM majors in the student body overall from 19.5% to 21.4% of degree-seeking undergraduates from year 1 to year 3 of the grant. At HWC, STEM majors have increased by 42% relative to pre-STEM values, primarily due to large community college enrollment increases in 2009-2010.

Retention Initiatives. Retention initiatives enacted include summer math placement camp and academic year cohorts at HWC, and math and chemistry bridge camps and academic year peer tutoring in core STEM courses at RU. Despite these initiatives, the pass rate in targeted core STEM courses is down from nearly 80% (2007) to only 71% (year 2). This erosion in course-level pass rates is presumably due to the increased number of students and sizes of sections of core STEM courses, coupled with decreased initial math placement of entering STEM majors, from ~38% of incoming STEM majors placing below College Algebra in 2007 (pre-STEP), to nearly 46% in Fall 2010. Programs to improve initial math placements of students and offer summer and academic-year math and science support should be critical to improving course-level and overall retention in the STEM disciplines. While course-level retention has declined, at the program level, these efforts are beginning to show results. While fall-to-fall retention rates of incoming STEM majors were down substantially in year 1 relative to pre-grant levels, retention rates of STEM majors rose 11.6% from year 2 to year 3, while retention of all degree-seeking undergraduates improved by only 1% in the same period.

Undergraduate Research. Undergraduate research initiatives include increased use of class-based research projects in majors-level STEM courses, and a 10-week summer undergraduate research program. In years 1, 2, and fall of year 3, a total of 7 STEM courses (unduplicated count, both HWC and RU) have added or substantially upgraded class-based research, running a total of 20 sections, and enrolling a total of 336 students. Summer research programs in years 1 and 2 provided individualized student-faculty research for 26 undergraduates. Both class-based and summer research projects have resulted in student attendance and posters at multiple local, regional and national conferences.

Student Scholarships. Overall, in years 1-2 combined, HWC and RU have awarded over \$50,000 in scholarships to over 136 recipients (duplicated counts), awarded primarily as book scholarships and in some cases limited tuition scholarships for program participants. Faculty and Curricular Development. In years 1 and 2, 34 faculty between the two institutions participated in faculty development opportunities, many of them joint, resulting in modifications to 19 sections of STEM courses, affecting a combined enrollment of 671 students. Curricular improvements include class-based research in all the HWC cohorts. At RU, class based research in core STEM courses, often with a civic engagement theme, has been implemented in two of our three target areas (biology and mathematics), with a pilot run in chemistry underway for Spring 10.

Broader Impact. While the goal of this project is to increase the total number of STEM majors and graduates, an important secondary goal is to broaden the participation of underrepresented minorities and women in science. In keeping with that goal, RU and HWC have consistently recruited a minority and female students to participate in STEP programs at percentages equal to or exceeding those of broader STEM majors and degree-seeking undergraduate. Minority participation in STEP programs has increased over the three years of the grant, with minority participation increasing from 28 to 44% from year 1 to year 3 at RU, and from 56 to 81% over the same period at HWC. At RU, this has been effective in increasing the percentage of minority STEM majors overall, which have increased from 28 to 39% over the life of the program, compared with an increase from only 35 to 38% in all degree-seeking undergraduates. Female participation also remained high for all three years at both institutions.

The overall goal of this program is to have a broad-based impact on the retention rates, graduation rates and number of graduates in our full population of STEM majors, rather than on specific cohorts of STEM students. To date, program activities have not been implemented for sufficient time to determine whether they are having a significant impact on the number of STEM degrees awarded or on 4- or 6-year graduation rates for all STEM students or on direct STEP participants. However, in order to better evaluate the effectiveness of particular activities, we are currently working to evaluate the effect of each program initiative on the retention and graduation rates for specific participants in that initiative. However, this evaluation is very challenging, due to the small n for specific traceable participants in particular programs, the limited time to date over which to track individual participants, methodological constraints in comparing participant tracking data to university-determined retention statistics, diverse and cross-participating groups of participants in various programs, and difficulty in defining and obtaining data for comparison or control groups.

Poster #: 3 - 09

Session: C

Lead Institution: **SUNY at Albany**

Authors: **Rabi Musah**
Denise McKeon
Hua Shi

| | | | | | |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | All STEM | Year 3 | Type 1A | 0756985 | NY |

Poster Title: **Increasing STEM Student Graduation Rates: A Holistic Model**

Keywords: **Recruitment, Peer Tutoring**

Poster Abstract: The Center for Achievement, Retention, and Student Success (CARSS) is a comprehensive program that addresses retention of freshmen and transfer students in STEM fields at the University at Albany-State University of New York (UAlbany). We utilize a holistic model reliant on the creation of learning communities through group study and support. We have met the original program goals of: sustainability, institutionalization, provision of peer tutoring and peer/staff mentoring, ongoing project evaluation, and dissemination. The program continues to grow as evidenced by an increase in the number of tutoring sessions by 1,029 from year one to year two. As a result, pass rates in key gateway courses have improved. For example, the pass rate in Organic Chemistry I increased by 9% in year one and by 18% in year two, while the year one pass rate in General Chemistry I increased by 7%. Based on these two courses alone, 98 additional students will proceed toward graduation in STEM as a result of CARSS services. Inclusion of the data for Genetics, Physics and General Biology II increases this number by a factor of two. We specifically tracked STEM major sub-groups of female, self-identified minority and transfer students. CARSS tutoring had a statistically significant impact on pass rates of females in targeted biology, chemistry, and physics courses and on the pass rates of underrepresented ethnic groups for chemistry. There was an increase in CARSS participation among transfer STEM students, from 8% to 13% from year one to year two, and the 19% increase in pass rates for minority students in organic chemistry in fall 2009 translates into 10 students who we anticipate would not graduate without CARSS intervention. The project will be sustained because: (1) It has a dedicated permanent fully furnished space from which to operate; (2) UAlbany has committed to continuing the CARSS program coordinator staff line; (3) UAlbany has committed \$150,000.00 annually in support of the CARSS program at the termination of the grant funding period.

Poster #: 3 - 10 Session: A Lead Institution: **University of South Florida**

Authors: **Kandethody Ramachandran**
 Catherine Bénéteau
 Scott Campbell
 Gordon Fox
 Arcadii Grinshpan

| | | | | | |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | All STEM | Year 3 | Type 1A | 0756847 | FL |

Poster Title: **A STEP to Grow in Science-Engineering-Mathematics Undergraduate Degrees**

Keywords: **Peer Tutoring, Peer Mentoring, Supplemental Instruction, Introductory Courses**

Poster Abstract: The STEP project at USF is based on the premise that success in calculus is the gateway to success in the STEM fields. This project is aimed at increasing STEM graduates through intervention programs in the Engineering and Life Science Calculus sequences (<http://www.math.usf.edu/resources/step/>). Through this project we have developed and are implementing several transportable strategies: a one stop extended hour tutoring lab (STEM Mart), project-based teaching, peer leading, and undergraduate research. These strategies have transformed the teaching of calculus at USF and are already leading to increased retention and pass rates for students. STEM Mart is a tutoring center that provides undergraduate students in the STEM disciplines an opportunity to receive free tutoring from other undergraduate students selected by the program. From Fall 2008 to Fall 2010, a total of 5990 student visits to STEM Mart were recorded. Over five semesters, a total of 461 calculus projects have been developed by the project team and completed by the students (by discipline: 338 engineering, 51 medical, 53 natural sciences, 19 other fields). Of these, 91 projects were provided by experts external to the university. The activities involving the development of the project repository have led to the creation of a new center (Center for Industrial and Interdisciplinary Mathematics) at USF. We developed a curriculum of inquiry-based activities, following the Process Oriented Guided Inquiry Learning (POGIL) approach for both Engineering and Life Sciences Calculus I. A total of 1,703 students have been impacted by twenty peer leaders in Calculus I from Fall 2008 through Fall 2010. The University of South Florida has a well developed structure supporting and promoting undergraduate research. It is expected that by engaging in the project option, students will be more interested in being involved in real life problem solving and hence undergraduate research. We have created an electronic journal called Undergraduate Journal of Mathematical Modeling: One + Two in which selected projects are published. The analysis of the data indicates that the project methods had significant impact on success rates of our students. We have observed increased passing rates (20%) in Calculus for students who visited STEM Mart five or more times during a semester, increased pass rates (10%) and decreased withdrawal rates (between 5 – 15%) for sections that offer the project option as well as for sections that offer peer leading. Data also indicates that several peer leaders are becoming engaged in undergraduate research and are seeking admission to graduate school in STEM disciplines.

Authors: **John Reisel**
Ethan Munson
Edward Beimborn
Hossein Hosseini
George Hanson

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| PhD | Engineering | Year 3 | Type 1A | 0757055 | WI |

Poster Title: **Fostering Opportunities for Tomorrow's Engineers (FORTE)**

Keywords: **Math Preparation, Peer Tutoring, Peer Mentoring, Supplemental Instruction**

Poster Abstract: The University of Wisconsin-Milwaukee (UWM) is an urban research university which has as part of its mission to be accessible to a wide range of students. Many students who enroll in the College of Engineering and Applied Science (CEAS) at UWM often are lacking the preparation necessary to successfully complete their program. The FORTE program aims to improve retention and graduation rates through three main components. (1) A peer mentoring program for incoming freshmen and transfer students has been established, with all incoming freshmen students assigned to a peer mentoring study group based on their math course. This began in the Fall 2009 semester. (2) A summer bridge program to improve math placement scores for incoming freshmen has been implemented. This program targets freshmen whose success has been hindered by needing remedial math instruction, and the corresponding lack of connection with the engineering program. In the Summer 2009 program, 37 students fully participated, and this number increased to 47 in the Summer 2010 program. In 2009, 67.6% of the students improved their math course placement through the program, and 83% improved their placement in 2010. (3) A living-learning community was established with a start date of Fall 2009 for students who desire to be surrounded by other engineering students in a supportive environment. Forty-one students joined the LLC for its first year, and 42 students joined the LLC in 2010; this makes it one of the largest LLC at UWM. This LLC and the opportunity for being peer mentors to incoming students in the future are two initiatives primarily targeted to well-prepared students who lose interest in engineering due to a lack of engineering content in the curriculum during their first year of college.

One challenge which has faced the FORTE program is getting freshmen student participation in all aspects of the program, but in particular the peer mentoring study groups. The study groups were first used in the Fall 2008 semester, and were purely optional for the students. As a result, very few students (16) participated in any way. For the Fall 2009 entering freshmen class, all freshmen were assigned to a study group based on their schedule availability and their math course. Participation improved to 133 students, although many of those students only attended 1-3 weekly sessions during the semester. Participation in the Spring 2010 semester dropped considerably, likely due to students finding their own study networks. In addition, the procedure used to assign study groups, for which participation was still optional, was time-consuming. For the Fall 2010 semester, a specific course with numerous sections based upon math course coverage was created, and incoming freshmen were encouraged to register for this course by the advisors. Participation increased to 147 (with 177 signing up for a section), and students also had some reason to commit to the program: they received a grade based upon participation and this would appear on their transcript. Results from the Fall 2009 semester indicate that study group participation is beneficial for many students with respect to their success in their math courses.

A second challenge which has faced FORTE is ensuring the success of Bridge program students who improve their math course placement in their first math course. Results from the 2009 Bridge program students indicate that many students struggle in their first math course, although at the same time many students do succeed in their math courses and clearly benefit from improving their math course placement through the Bridge program.

Poster #: 3 - 12 Session: C Lead Institution: **Rutgers University - New Brunswick/Piscataway**

Authors: **Kathleen Scott** **Suzanne Blanc**
 Ghada Endick **Issata Saccoh**
 Marie Logue

| | | | | | |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | All STEM | Year 3 | Type 1A | 0756879 | NJ |

Poster Title: **RU Stepped Up for Success**

Keywords: **Math Preparation, Peer Mentoring, Learning Communities**

Poster Abstract: RU-STEPed Up for Success is a set of cohesive programs designed to increase the number of students receiving baccalaureate degrees from Rutgers University – New Brunswick in science, technology, engineering and mathematics (STEM). RU-STEPed Up for Success recruits STEM majors from under-represented groups (women and minorities) and improves retention through summer bridge experiences, academic support, and mentoring. Program offerings include the AIMS (Achievement in Math and Science) residential and non-residential learning communities for first-year students in precalculus or intermediate algebra, Rosalind Franklin House (RFH) living-learning community for first and second year women majoring in STEM, and Science Success Fast Track, residential and non-residential learning communities for transfer students. All learning communities include at least one linked course, and AIMS students are enrolled in the same sections of mathematics, writing, and the First Year Interest Group (FIGS) “Exploring Careers in the Sciences”. Science Success Fast Track students participated in the same “Students-In-Transition” seminar to ensure a smooth entry to Rutgers. All residential communities were provided appropriate tutoring (math, physics, organic chemistry, biology and writing workshops) and peer mentors in residence who provide programming, mentorship and guidance. Non-residential mentors are provided for the commuter and non-residential students in the programs, who are also included in programming and tutoring.

During the first 2.5 years of the project, 177 first-year students have participated in the AIMS residential learning communities, 80 in the AIMS non-residential communities, and 36 in Rosalind Franklin House. Additionally, 34 second year women have participated in Rosalind Franklin House and 178 transfer students have participated in the Science Success Fast Track learning communities. Eighty-four (84) upper level undergraduates have participated as peer mentors. A total of 117 students have participated in the two summer bridge programs; 43 of these students joined one of the learning communities in their first year. Survey and focus group evaluations from all of the learning communities indicate that they are successful in helping students adjust to college life. Although differences in first year retention rates are not statistically significant between the first year learning communities and the entering STEM population, a slightly higher percentage of AIMS, RFH, and summer bridge students are retained. The first year students in the AIMS community are more successful than non-AIMS students in earning grades of “C” and above in intermediate algebra (significant at .001 level) and precalculus (not statistically significant). RFH students are academically successful overall: 78.5 % earned a “B” or higher in Expository Writing, compared to 67.8% of STEM students, and 70% of RFH students earned at least a “B” in Calculus I compared to 48.9% of STEM students, although these differences are not statistically significant. Science Success Fast Track students remain enrolled at rates comparable to STEM transfer students generally, but declare STEM majors earlier, and possibly at higher rates than the comparison group of STEM transfer students. Among SSFT students, 62% of residential students and 74% of non-residential students have declared STEM majors, compared to 52% of their STEM transfer student cohort. Additionally, the residential students had an overall GPA of 3.23, which compares favorably to the entire STEM cohort average GPA of 2.868.

Poster #: 3 - 13 Session: A Lead Institution: **University of Northern Colorado**

Authors: **C. Gardiner**
R. Adams
G. DeKrey
R. Reinsvold
J. Sexton
C. Russell

| | | | | | |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Science | Year 4 | Type 1A | 0622421 | CO |

Poster Title: **Increasing Student Graduation in the Biological Sciences**

Keywords: **Recruitment, Introductory Courses, Program Evaluation**

Poster Abstract: The Biology Is your Opportunity to Achieve (BIOTA) program is a STEP project at the University of Northern Colorado. The program's primary goal is to increase the four-year graduation rate of biology students. A secondary goal is to increase the number of students choosing biology as a major. To accomplish these goals, the BIOTA program provides several recruitment and retention experiences including 1) undergraduate research experiences, 2) undergraduate scholarships, 3) biology freshmen seminar study skills courses, 4) tutorial-style companion courses to accompany introductory biology classes, 5) peer mentoring, 6) academic advising, and 7) social activities to foster a sense of community.

The BIOTA program is in its fourth year since beginning in June 2007. The number of students choosing biology as a major has increased by 37%, which exceeds the project objectives. However, the graduation rate of biology majors by declined by 12%. The project had hoped to increase the graduation rate by 22% by the fourth year of the project. We are trying to better understand the role our activities are having in recruitment and retention. We report on one investigation to identify the effect our tutorial-style companion courses have on students' intent to major in biology.

Poster #: 3 – 14

Session: B

Lead Institution: **New Mexico State University**

Authors: **Ricardo Jacquez
Delia Valles
Michele Auzenne**

| | | | | | |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Engineering | Year 4 | Type 1A | 0652968 | NM |

Poster Title: **New Mexico State University Science, Technology, Engineering, and Mathematics Talent Expansion Program (STEP) Integrated Learning Communities, Mathematics Support, and Community College Transfer**

Keywords: **Math Preparation, Learning Communities, Introductory Courses, Underrepresented Students**

Poster Abstract: Program components of the New Mexico State University STEP grant include faculty-coordinated Integrated Learning Communities (ILCs), pre-transfer support to SMET community college students, a “Mathematics Boot Camp” to support students’ performance on the NMSU Mathematics Placement Exam, and mathematics learning support throughout the freshman year. Leveraged support of the NSF-funded Louis Stokes New Mexico Alliance for Minority Participation Program (New Mexico AMP) ensures that all students enjoy a broad range of interventions and resources.

Integrated Learning Communities:

Integrated Learning Communities (ILCs) are designed to provide intrusive mentoring support, personalized attention, and integrated instruction through a clustering of five courses in the fall semester and three in the spring semester. The ILC is specifically designed to:

- Bridge students through their early math sequence and on to the calculus level by incorporating engineering concepts into the pre-calculus mathematics courses.
- Emphasize important topics such as engineering design process and professional ethics.
- Provide academic planning and support.
- Provide supplemental instruction in mathematics and chemistry – courses that traditionally block the success of these students.
- Provide social integration with peers and the early exposure to the culture and study of engineering.

Pre-Transfer Support:

Community College Transfer Workshops address two critical needs: 1) assistance in understanding and selecting conference sessions and activities, and 2) an orientation to using established state-wide articulation agreements to most efficiently plan one’s transfer from the community college to the university. A professional development stipend recognizes and values the time and effort that conference attendance requires as well as to provide much needed financial support to participating students.

Mathematics Boot Camp:

One-week refresher courses have been held in Las Cruces (southern region) and Albuquerque (northern region) to ensure that students are placed in the appropriate mathematics courses at NMSU. Boot Camp courses are offered at the pre-algebra and algebra levels.

Mathematics Support:

In the first four years of the project, engineering faculty worked with the Mathematics Department to develop engineering-specific problems and applications that currently serve as supplemental materials for the algebra series. These modules are available for use in all algebra courses at NMSU, not only those sections of the courses associated with the STEP grant. In the final year of the project, ILC students will also benefit from peer mentoring by engineering seniors and mathematics tutoring.

Authors: **Bryan Tippet**
Sylvia Orr
Jennifer Damron
Denise Garland
Jann Contento
Rene Willekens

| | | | | | |
|-----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Two Year | All STEM | Year 4 | Type 1A | 0653206 | AZ |

Poster Title: **Building STEM Transfer Success: A Community College Cohort Approach**

Keywords: **Recruitment, Math Preparation, UG Research/Internship Opportunities, Learning Communities**

Poster Abstract: The intellectual merit of this project is embedded in an approach designed to increase the number of Estrella Mountain Community College students completing associate degrees in STEM areas and/or transferring to four-year institutions. A broader impact of this project is to expand STEM opportunities to underprepared and non-traditional students. Estrella Mountain initially developed a 2-tiered cohort program (pre-STEM and STEM). Unfortunately, the two-tier cohort approach proved impossible to implement as originally planned. Attempts to recruit pre-STEM students fell way short of projections. This challenge led the college to abandon the two-cohort model in favor of a focus on students who met eligibility for the STEM cohort. The STEM cohort is fully supported by faculty mentors who effectively address academic challenges which often limit participation in STEM degree programs. In addition, the cohort is supported through expanded student recruitment; cohort learning communities; faculty and peer mentoring; field experiences (local and distance); career exploration (discussion panels, guided resume’ and personal statement development, internship and research opportunities); financial scholarship incentives; professional networking and community awareness through STEM club participation; and a systemic change to the delivery of the math curriculum.

Math curriculum improvements include a “Math Emporium” that helps increase student access to interactive online support materials as well as improve student faculty engagement. Mathematics curriculum improvements, which include modularizing the developmental mathematics sequence, are showing evidence of higher academic achievement when students are provided a greater level of hands on learning combined with increased faculty and student engagement. The Math Emporium also benefits the entire student population in addition to the STEM oriented cohort. Significant recruitment efforts by the college encourage service area high school graduates to enter into this program. Promotional materials that focus on the benefits of the cohort program and the STEM career field are used as a component of recruitment.

Early results:

The ongoing development of modular courses that decrease time spent in developmental mathematics provides additional time-on-task for STEM students. Further development of the “My Math Lab” online learning component has shown improved results regarding course content feedback and student and faculty interaction. The support of faculty mentors for STEM students has helped recognize early academic challenges and contributed to the recruitment and preparation of qualified student mentors. To date, of 102 recent scholarship recipients, 22% have completed degree requirements (16% in the Associate of Science) and 56% continue to be enrolled making progress toward degree completion.

Poster #: 3 – 16

Session: A

Lead Institution: **San Jose State University**

Authors: **Dan Walker**
Maureen Scharberg

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 4 | Type 1A | 0653260 | CA |

Poster Title: **STEP at SJSU: Improving Retention through Student Learning Communities**

Keywords: **Peer Tutoring, Peer Mentoring, Supplemental Instruction, Learning Communities, Student Tracking**

Poster Abstract: The College of Science at San Jose State University has embarked on retaining and graduating an increased number of STEM majors on our campus who currently leave our programs. We now have workshops that utilize cooperative group learning in Pre-calculus and the Calculus series. Over the past three years, the passing rate (grade of C- or better) has increased by at least 10% in all of the courses. Thus, an additional two hundred+ STEM majors remain successfully on track towards graduation each year. Our probation workshops and other interventions are successfully returning about 70% of the students to good academic standing. The mandatory advising that we instituted for all students entering the College of Science is improving significantly the time to graduation. The project employs a cadre of undergraduate peer leaders, tutors, and mentors. The project is being evaluated by tracking every new College of Science or College of Engineering student in their science and math courses semester by semester, plus their subsequent graduation success, to assess increased retention and graduation rates.

Poster #: 3 – 17 Session: B Lead Institution: **Fayetteville State University**

Authors: **Erin White**
Daniel Okunbor
Frank Nani

| | | | | | |
|------------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Bachelors | All STEM | Year 4 | Type 1A | 0653157 | NC |

Poster Title: **Fayetteville State University (FSU) Opportunities for Talent Expansion in Interdisciplinary Education for Minorities and Women in Undergraduate Mathematics and Science (OpTIMUM)**

Keywords: **Student Tracking, Underrepresented Students**

Poster Abstract: The NSF STEP FSU Opportunities for Talent Expansion in Interdisciplinary Education for Minorities and Women in Undergraduate Math and Science (OpTIMUM) is designed to address challenges faced by undergraduate students in STEM disciplines at Fayetteville State University. Since fall 2007, the OpTIMUM program has sought to increase, improve, develop and/or strengthen access to academic opportunities/resources that will enhance the academic success of students as they complete baccalaureate degrees in STEM disciplines. To date, the program has (a) improved the educational opportunities of under-represented students and women, as well as student access to and utilization of support projects by offering tuition assistance, opportunities to conduct intramural research with STEM faculty, discipline-specific academic advisement through 1st year Learning Community, tutoring in STEM disciplines; study socials, travel to STEM conferences/present research findings, interdisciplinary workshops/seminars, resource center/computer lab, GRE preparation; (b) assisted in the development of academic degree articulations (2 + 2) and dual enrollments for the following degree programs: Biotechnology, Forensic science, Fire Science; (c) and strengthened partnerships between the university and local school districts and STEM organizations by: creating STEM Educators Network (network of local school districts and STEM faculty), actively engaging representatives from local STEM organizations/industries by serving on the External Advisory Board and presenting seminars to STEM faculty/staff.

The OpTIMUM program defines success based on STEM enrollment, 1st and 2nd year retention and graduation rates. A significant number of students (129 to date) receiving direct support, are retained year to year and are on track to graduate in 4 - 5 years. Currently, 60% of the cohort from [2007-2008] persisted through year 3 and are likely to complete STEM degree by 2012. The 1st year retention rate of that same cohort (80%) [2007 - 2008 cohort = 20 1st time freshmen] is higher than the retention rate reported by the university (69%). If smaller groups (i.e. cohorts) have increased retention and graduation rates compared to the institution, then it will have a positive impact on STEM overall. Moreover, OpTIMUM participants who were absorbed to the NIH MBRS RISE and the NSF LSAMP programs are actively involved in undergraduate research with faculty. Furthermore, the OpTIMUM program is supporting a number of faculty to mentor undergraduate students in a variety of scientific research projects, including research in computer networks, mathematical modeling, toxicology, nanotechnology and biodiesel fuels. Since 2008, twenty-eight (28) students have been involved in undergraduate research. Overall, the program has met its benchmark projections for total number of students enrolled. In fall 2006, there were 206 students enrolled in STEM disciplines (excluding psychology). Each year that number has increased and in fall 2009 there are 531 students enrolled. However, the number of STEM degrees conferred overall is declining. In 2006, 82 degrees were conferred. In 2009, that number had decreased to 67 degrees and 2010 increased to 70 degrees conferred.

Solid collaborations are beneficial in maximizing the number of students served. The FSU OpTIMUM program continues to work with other STEM programs other federally funded STEM programs at FSU, as well as working very closely with the newly established Integrated STEM Academic Support office to implement strategies with the overall goal of increasing (i) enrollment; (ii) retention; (iii) and graduation rate of underrepresented groups and women pursuing baccalaureate degrees in STEM disciplines. With continued institutional support the OpTIMUM program will continue to impact STEM at Fayetteville State University.

Poster #: 3 - 18

Session: C

Lead Institution: **Towson University**

Authors: **Jane Wolfson**
Marianna Gleger
Annie McMahon
Joanne Settel

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 4 | Type 1A | 0653011 | MD |

Poster Title: **Towson Opportunities in STEM (TOPS): Towards a Change in Community Culture**

Keywords: **Peer Tutoring, Learning Communities, Underrepresented Students**

Poster Abstract: TOPS is a cooperative effort between Towson University and Baltimore City Community College. The program was designed to recruit and retain students with STEM career interests who are from underserved communities in the Baltimore region; at Towson we recruit high school students while at BCCC we recruit from among the current student body. We have developed a range of highly effective programs and practices appropriate for our target audiences at each institution; creation of community is a key component to both programs. In our poster we present data which demonstrate our program’s effectiveness in STEM student retention.

The programs at Towson consist of a variety of academic, personal and financial support systems including: 1) an intensive week-long summer experience for first year TOPS students, 2) a living-learning community for residential TOPS students, 3) intensive mentoring in life and time management skills, 4) cohort registration in bottleneck courses, and 5) proactive/preventative tutoring sessions. All of these activities contribute substantially to our students’ academic success.

During the intensive week-long summer experience, incoming students are actively involved in both academic and extracurricular activities. During the week students experience a ‘typical’ series of lectures and laboratories delivered by STEM faculty, and receive and complete typical assignments from these ‘classes,’ i.e., essays, exams, presentations, lab reports, computer models, etc., which are evaluated using ‘typical’ evaluation metrics. Through directed activities, the students assess their personal skill sets and develop an understanding of faculty performance expectations. The extracurricular activities during this week involve exploration of time management, learning styles, community building, exploration of the physical campus, etc.

Our residential TOPS students share a residence hall floor with other STEM students. Many of the residents on this floor take the same courses at the same time thereby facilitating the development of a living-learning community. The Resident Assistant for the floor comes from within the TOPS community and is intimately familiar with the unique challenges faced by STEM majors. In addition, upper class TOPS students reside on the floor and act as community leaders and peer mentors to the other residents.

At TU we routinely enroll our incoming TOPS students [and current TOPS students as appropriate] in the same sections of the gateway STEM classes. This community of learners is encouraged to form study groups. Tutors, many of whom are more advanced TOPS students, are made available for the entire cohort. All first year students meet weekly with the Program Coordinator and as a group bi-weekly. They are carefully mentored and their adaptation to campus and courses is closely monitored during this critical time. Students are often found in the TOPS learning center, a study space and computer lab dedicated to the program.

A community of learners preparing for transfer to Towson is developed at BCCC through a series of seminars for STEM Scholars supported through the TOPS program. These credit-bearing seminars help students understand themselves and improve their academic readiness by exploring their organizational and time management skills, identifying individual learning styles, learning to overcome test anxiety, and consider challenges they might face in the future. The seminars also help students understand their major and the potential career pathways associated with different fields of study. Students at BCCC who are part of the STEM scholar program participate in a variety of community building activities including participation in "Math Awareness Week", and field trips to local conferences and science festivals. BCCC students transferring to Towson are assisted through the transfer/registration process, integrated into ongoing TOPS activities at Towson upon their arrival, and actively mentored through degree completion at Towson.

Authors: **Barbara Speziale**
Matthew Ohland (Purdue University)
Jeffrey Appling
Dennis Stevenson
John Wagner
Calvin Williams

| | | | | | |
|-------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | All STEM | Year 5+ | Type 1A | 0525474 | SC |

Poster Title: **CU-STEP: Promoting Success for First-Generation College Students in STEM**

Keywords: **Peer Mentoring, Learning Communities, Student Tracking, Institutional Change**

Poster Abstract: The goal of the CU-STEP project is to increase the numbers of students enrolled in and graduating from all STEM programs at Clemson University, South Carolina's land-grant institution. The target audience for this project is Clemson University STEM students whose parents did not graduate from a 4-year college or university -- "first generation college students." Approximately 11% of Clemson's incoming STEM freshmen identify themselves as first generation. The need for this program was based on data from educational reviews and national reports indicating that first generation STEM majors were more likely than non-first generation students to either change majors or drop out of college completely. To retain these students in Clemson University STEM majors, CU-STEP designed the First Generation Success in Research, Science and Technology program (FIRST) to include a pre-freshman year summer program, academic year proactive mentoring, and supportive student activities such as field trips, social/academic events and curriculum reforms.

FIRST was established in 2006 and has since served five cohorts of first generation college freshmen. The FIRST Summer Preview began in 2007 and has served four cohorts. Approximately 40% of Clemson's first generation students in STEM participate in FIRST. Assessments compare the academic performance of first generation students and non-first generation students from freshman year through graduation. A baseline analysis of pre-college factors showed these student groups to be similar in most admissions data (SAT scores, predicted grade point ratios, high school grade-point average, and high school rank). Students entering FIRST as freshman in 2006 began graduating in 2010.

In this fifth year of CU-STEP, our most visible result is an 18% increase (1089 students) in students enrolled in STEM majors at Clemson University, and a 14% increase in STEM graduates. Enrollment in Geological Sciences, one of the particular targets of our efforts, has increased 137% since the inception of the grant although it is still small, at 45 students. Though the building of social capital is less easily quantifiable, students in focus groups and unsolicited testimonials consistently credit FIRST as important to their success at the university and in STEM majors. It is indicative of the success of FIRST on the Clemson University campus that other departments frequently ask how to set up similar programs for their first-generation students.

The CU-STEP project faces the challenge of how to sustain the FIRST program. In an initial move towards sustainability, Clemson University hired the FIRST coordinator as a permanent employee and has contributed to the salaries of the FIRST student mentors. Additional funds are being sought from grants, foundations and private donors.

Other Authors: Robert Ballard, Clemson University; Susan Lasser, Clemson University

Poster #: 3 - 06

Session: B

Lead Institution: **Piedmont Virginia
Community College**

Authors: **Ali Bouabid
Michael Cabral
Andrew Renshaw**

| | | | | | |
|-----------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Two Year | Engineering | Year 5+ | Type 1A | 0622443 | VA |

Poster Title: **Expanding Engineering Opportunities**

Keywords: **Recruitment, Peer Mentoring, Articulation & Transfer Issues, Student Tracking,
Underrepresented Students**

Poster Abstract: s grant enhances the PVCC engineering program and helps to increase the number of students who enter the program and ultimately transfer to four-year institutions to complete a Bachelor's degree. PVCC has seen a significant increase in the number of students entering the engineering program, from 34 new students in fall 2006 semester to 67 new students in fall 2010. This is significantly greater than the grant's target increase for entering students of 10% each year. The year-to-year retention rate for students in the engineering program has also grown from 53% for fall 2006 to 64% for fall 2010. Additionally, the number of PVCC engineering students who transfer to a four-year institution has grown from 14 students in fall 2006 (baseline) to 29 in fall 2010.

One activity designed to enhance the experience of the engineering students is the E-Mentoring Initiative. PVCC developed this program to provide students with an avenue to learn more about the field of engineering and receive career and academic advice and support. Engineers from a variety of disciplines across industry and academia have served as e-mentors for over 160 new PVCC engineering students as part of this program. By eliminating the need for scheduled meetings, e-mentoring affords students and mentors greater flexibility than traditional face-to-face mentoring, while still providing for valuable interaction and communication.

Surveys completed by the student participants in 2009-2010 help illustrate the effectiveness of this program:

- 88% of participants stated that their mentor provided good support and guidance
- 68% indicated that participating in the program helped give them a better sense of the job they may want to pursue in the future
- 20% changed the school to which they plan to transfer or the engineering major they plan to pursue as a result of participating in the program.

Poster #: 3 - 21

Session: C

Lead Institution: **West Virginia University**

Authors: **Gene Cilento**
Gary Winn
Robin Hensel

| | | | | | |
|-------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Engineering | Year 5+ | Type 1A | 0525484 | WV |

Poster Title: **Engineers of Tomorrow**

Keywords: **Recruitment, Peer Mentoring**

Poster Abstract: The project involves four tightly coordinated strategies for outreach to high school students and for retention of college freshmen. The resulting activities are attracting qualified Appalachian high school students, particularly women and underrepresented minorities, to engineering and science-oriented programs, retaining them during their first year in engineering, and encouraging the improvement in math scores for all students. The first strategy trains 25 teachers per year with a set of teaching tools, referred to as TIME (Tools for Integrating Math and Engineering) kits, ultimately reaching 125 teachers who will impact 12,500 students annually. Developed by West Virginia University faculty from engineering, mathematics, math education, and physics, working with master mathematics teachers, the TIME kits are authentic problem-based engineering lessons designed to increase student achievement in math and interest in science and engineering. Math concepts are tied to the curriculum requirements of the West Virginia Department of Education Content Standards and the National Council of Teachers of Mathematics (NCTM) standards. The second strategy is a summer experience program designed to encourage minority and female students to participate in a science or engineering field and to mentor students without a support system at home. This program provides intensive instruction for 80 Appalachian, minority students and women each year. Students attend in cohort groups for one week and maintain contact with the program during the subsequent academic year through engineering student mentors. The curriculum consists of introductory engineering training; basic math, science and technology skills; ACT/SAT preparation; and study skills necessary to survive on a large college campus. The third strategy, an on-line, college-credit course for high school students, is drawn from the existing first-year curricula. This course provides capable high school students a chance to better understand engineering career options before entering a college program and gain college credit that will reduce the time needed to complete their degree. The fourth strategy is a first-year engineering retention program that emphasizes mentorship and coaching. The investigators have evaluated these interventions and find that enrollment exceeds expectation in both engineering and STEM disciplines. Finally, dissemination of these methods and findings are being achieved through presentations at professional education and engineering education meetings and by publications in professional journals.

Poster #: 3 - 22

Session: A

Lead Institution: **Kansas State University**

Authors: **Kimberly Douglas-Mankin**

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|-------------|---------------------|----------------|----------------|----------------|-----------|
| PhD | All STEM | Year 5+ | Type 1A | 0525556 | KS |

Poster Title: **K-State STEP: Increasing the Number and Diversity of Students Graduating in STEM fields at Kansas State University**

Keywords: **Math Preparation, Peer Tutoring, UG Research/Internship Opportunities, Program Evaluation, Student Tracking, Underrepresented Students**

Poster Abstract: Kansas State University (K-State) attracts excellent students, and throughout the duration of the project implementation period, had a pathway of opportunities to engage in science, technology, engineering, and mathematics (STEM) from grade school through graduate school, and beyond. K-State STEP focused on making a difference for STEM students by creating a multi-faceted system of interventions to increase student retention, particularly in the first year. The project originally included six initiatives: peer-tutoring, freshman internships, job shadowing, hands-on supplemental workshops, a summer bridge course, and a family connections program. At the project's third year review, the decision was made to focus on the three programs that were realizing the most significant impacts:

Scholars Assisting Scholars (SAS) – employs exceptional students who are female, students of color, or first generation to staff a tutoring program to serve all students.

CampuS Internships (CSI) – provides incoming students the opportunity to investigate STEM research early to help maintain their interest as they take foundation courses that can be discouraging and seem disconnected from STEM professions.

CONNECT: K-State Family Connections – creates communication linkages with family and friends of students to support student success in science and engineering.

These three initiatives had significant impacts on retention and degree completion of students who participated. The project in its first year of no cost extension, and has shifted focus to tracking and researching the impacts of programs with the small amount of residual funds. Results from SAS are statistically significant for grades, retention, and degree completion. The College of Engineering has sustained the SAS program and CONNECT in this sixth year, and will be using resources for new student fees to fund these programs in the future.

Poster #: 3 - 23 Session: B Lead Institution: **Oakton Community College**

Authors: **Joe Kotowski**
Gloria Liu
Carol Ward
Michael Farquhar

| | | | | | |
|-----------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Two Year | All STEM | Year 5+ | Type 1A | 0622329 | IL |

Poster Title: **Center for Promoting STEM**

Keywords: **Recruitment, UG Research/Internship Opportunities, Career Counseling, Faculty & Staff Development, Program Evaluation**

Poster Abstract: Built and expanded upon a previously successful project, the Center for Promoting STEM (CP-STEM) has been established to increase the number of students who pursue studies and receive a degree in Science, Technology, Engineering and Mathematics. The goals of CP-STEM are:

- To encourage and enhance student success in STEM courses;
- To develop STEM activities and programs in a supportive, rewarding environment;
- To partner with professional organizations, businesses, and high schools in an effort to promote and sustain STEM activities;
- To study, investigate, and incorporate innovative STEM teaching techniques;
- To contribute to the literature on teaching and learning through program assessment;
- To distribute the successful results of CP-STEM activities.

CP-STEM offers the following programs: STEM Mentoring Program, Study Sessions, STEM Internship Program, STEM Success Seminars, STEM Faculty Leadership program, Student-Industry-Teacher Simulations. CP-STEM also collaborates with student organizes that arrange academic, career and social activities.

- Over ten semesters, STEM Mentoring Program served an average of 55 students per semester. Spring 2011, 33 mentors supported 66 students. A majority of students participated in the program for two semesters. A handful participated at most five semesters. An average of approximately 20% of the participants transfers to a four-year school each semester.
- CP-STEM held the Fourth Conference for Promoting STEM on Oct. 29, 2010 with 52 participants from elementary school to four-year schools to industry discussing strategies to offer hands-on STEM experience to students.
- Since fall 2007, seven STEM faculty met in PBL seminars and designed 7 original PBL scenarios. Six STEM faculty from area high school also participated and designed 5 original PBL scenarios. For the first time spring 2011, Oakton faculty will lead a PBL seminar at a nearby college.
- Designed by faculty and industry, Student-Industry-Teacher Simulations provides hands-on activities for high school students. This event will be offered every other year when Oakton's Manufacturing Expo is not offered.

Authors: **John Nicklow
Lalit Gupta
Rhonda Kowalchuk
James Mathias
Kathy Pericak-Spector
Jale Tezcan**

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|-------------|---------------------|----------------|----------------|----------------|-----------|
| PhD | Engineering | Year 5+ | Type 1A | 0622483 | IL |

Poster Title: **Engineering and Technology Talent Expansion Program at SIUC**

Keywords: **Peer Tutoring, Peer Mentoring, Supplemental Instruction,
Learning Communities, Introductory Courses**

Poster Abstract: The College of Engineering at Southern Illinois University Carbondale aims to increase its five-year graduation rate from 37 to 67 percent by focusing on first- and second-year retention rates. Those rates have historically averaged 64 and 69 percent, respectively, and represent an opportunity for growth. A holistic freshmen-sophomore program consisting of seven major initiatives was launched in 2007. These initiatives include (1) a new Engineering Residential College that is the foundation of a new living-learning community; (2) a multi-tiered mentoring program that involves peer, faculty, and industrial mentors; (3) an innovative, hands-on Introduction to Engineering Course (ENGR 101) that is common to all first-year students in the College; (4) common cohort classes for Mathematics, English, and Speech Communications courses, many of which provide supplemental instruction; (5) a six-week, summer math (i.e., bridge) program to assist students in the transition to college and in preparation for college-level mathematics; (6) a new developmental math course designed to ready underprepared students for Calculus; and (7) a peer-tutoring program. Following three years of implementation and assessment, freshmen and sophomore retention rates are 72 and 78 percent, respectively. Formative successes are being experienced on all fronts, and project personnel are cautiously optimistic that these figures will translate into overall project success. These successes have also positively affected the College's ability to recruit new students and have provided the impetus for a broader, institutional movement towards living-learning communities and an organized First-Year Experience and University College program. That program has adopted many of the same activities implemented under the current STEP project. Based on the number of students impacted and the associated cost for each activity, the most cost-effective initiative is the Engineering Residential College. During each semester, nearly one-third of the College's 900 students reside in the Engineering Residential College. Nearly 90 percent of these residents are freshmen and sophomores, and the majority of those are impacted by multiple components of the project (e.g., participation in mentoring and enrollment in ENGR 101 and other common cohort classes). There were several early challenges in program implementation, including transitioning to the requirement that all first- and second-year students live on-campus in the Engineering Residential College; recruiting sufficient peer mentors at the outset of the project; and coordinating a College-wide course (ENGR 101) with a suitable meeting time and sufficient buy-in from all departments. The key to overcoming each of these challenges was and continues to be open and shared communication of program objectives and early successes. Current challenges focus on institutionalizing STEP activities and maintaining them following the funding period.

Poster #: 3 - 25 Session: A Lead Institution: **Northwestern University**

Authors: **Su Swarat**
Greg Light
Denise Drane
Sara Woods

| | | | | | |
|-------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Science | Year 5+ | Type 1A | 0525550 | IL |

Poster Title: **Engaging Undergraduates in Science: The Extended Science Workshop and the Science Research Workshop Program**

Keywords: **Peer Mentoring, UG Research/Internship Opportunities, Learning Communities**

Poster Abstract: Northwestern University's STEP Grant supports two programs—the Extended Science Workshop Program (ESW) and the Science Research Workshop Program (SRW)—both aimed at increasing the number of students pursuing majors in Biology and Chemistry.

The ESW program serves sophomores and juniors in the Organic Chemistry sequence, a course with the reputation of being extremely challenging. Following the model of peer-led learning, ESW students meet weekly for two hours in small groups (n=5-7) led by a peer facilitator, an advanced undergraduate student who excelled in the course previously. Students collaborate on solving conceptual problems that are designed by the course professor to be more challenging than regular homework problems. The cumulative evaluation results (from 2005 to present) suggest that the ESW program is effective in helping students earn a satisfactory grade (B+ or higher) and retaining more students in the course sequence.

The SRW program seeks to engage students in authentic scientific research early in their undergraduate career. The program provides guidance and support to help participants secure a research position in a science lab. In addition to regular access to the lab, students meet weekly for a "faculty café" followed by a peer-led workshop. In the faculty cafés, established scientists share their career paths into science research, and offer students advice on how to carry out independent research. In the peer-led workshops, students work under the guidance of a peer facilitator, an advanced undergraduate student who has tremendous research experience, to develop a research project and a research proposal. The proposals are submitted to Northwestern's prestigious Undergraduate Research Grant competitions. Since its conception in 2007, the SRW program has served over 80 students, over half of which have won independent funding to carry out their proposed studies. Evaluation data suggest high program satisfaction, and significant gains in terms of research self-efficacy.

The high demand from students and strong support from faculty for both ESW and SRW point out the necessity for Northwestern to continue and expand these programs. We continue to work with the university to seek ways to sustain these programs through institutional commitment and funding. Other challenges will also be discussed in the poster.

Poster #: 3 - 26 Session: B Lead Institution: **Georgia Southern University**

Authors: **Christine Whitlock**
Bret Danilowicz
Lisa Vance
Gus Molina

| | | | | | |
|-------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | All STEM | Year 5+ | Type 1A | 0622460 | GA |

Poster Title: **ASPIRES at Georgia Southern University**

Keywords: **UG Research/Internship Opportunities, Supplemental Instruction, Learning Communities**

Poster Abstract: The ASPIRES program at Georgia Southern University is implementing five initiatives to promote student academic achievement, retention and graduation in Science Technology Engineering and Mathematics (STEM) disciplines. A comprehensive student advisement center, based on an intrusive advising model, was implemented in January 2007 for all first year STEM majors. Thirteen faculty advisors, five staff advisors, and a career services professional provide academic advisement covering degree requirements, course selection and registration, career services, information on tutoring, workshops, financial aid, admission requirements for professional programs and health assessment referrals as well as monitoring the students' academic progress. Over ninety percent of freshmen and sophomores, or 1679 students, were advised in fall 2010. STEM-based Residential Interest Groups (RIGs) for incoming freshmen majors were implemented in fall 2007. The RIGs provide internal support through academic communities in chemistry, mathematics, pre-medicine, and biology, and feature linked courses in the major, English, mathematics and Freshman Seminar. The RIGs also feature topical programming, opportunities for group projects and activities and in-house tutoring. Students participating in the RIGs had higher GPAs than their peers who did not live in a RIG. Supplemental Instruction and Guided Inquiry programs have been implemented in introductory biology, chemistry, physics, trigonometry, pre-calculus, and calculus. These programs have resulted in increased student problem-solving and critical-thinking skills. Summer research opportunities for undergraduates were implemented in summer 2008. Eight freshmen participated in 2008, 22 freshmen and sophomores participated in 2009, and 20 freshmen and sophomores participated in 2010.

Authors: **Jianping Yue**

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|-----------------|---------------------|----------------|----------------|----------------|-----------|
| Two Year | All STEM | Year 5+ | Type 1A | 0622440 | NJ |

Poster Title: **Cultivating the STEM**Keywords: **Recruitment, Math Preparation, Peer Tutoring, Peer Mentoring, Learning Communities, Introductory Courses, Underrepresented Students**

Poster Abstract: The project aims to increase the retention, graduation, and transfer rates of STEM students at Essex County College (ECC) in Newark, New Jersey. ECC is a large two-year urban community college of more than 13,000 students with 79% minority population, including 52% African American students and 23% Hispanic students. The project takes a holistic approach to STEM education by immersing students in an environment that targets their different learning styles and academic needs. We seek to identify variables that impede academic success and design interventions to address these obstacles. The project provides many academic services to STEM students through the MESA center, which include workshops on study skills and time management, assistance in developing academic plans, peer tutoring, and faculty mentoring. A bridge-in program exposes high school and college freshman students to the STEM fields and uses contextual learning to address their developmental needs; a bridge-out program later assists students in transferring to four-year universities. The 2010 summer bridge program offered pre-college mathematics and introductory engineering courses, along with mentoring and tutoring sessions to a cohort of 17 incoming STEM students. The participants subsequently achieved higher passing rates in the program and STEM courses. The project also reaches out to high school students to prepare them for engineering programs by allowing them to take standard college-level mathematics and engineering courses at ECC. To date, 37 students from 20 high schools have participated in the high school initiative program. Many participants in these programs have either enrolled in STEM programs or graduated from ECC and then transferred to four-year universities. Internal and external evaluations have been conducted to improve the programs. The swipe card system, which improves data collection, recorded a total of 409 students participating in MESA center activities in spring 2010. The logs also show that in spring 2010, 220 and 130 students received tutoring and mentoring services, respectively. A total of 195 associate degrees in STEM majors were awarded in the 2009-2010 academic year (an increase of 40% from the previous year). Computer hardware and software in the MESA center have been recently upgraded. Further improvements are planned based on the internal and external assessments and evaluations.

Poster #: 3 – 28 Session: A Lead Institution: **Miami-Dade College - Wolfson Campus**

Authors: **Cynthia Conteh**
Guillermina Damas

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|-----------------|---------------------|---------------|----------------|----------------|-----------|
| Two Year | All STEM | Year 4 | Type 1A | 0653098 | FL |

Poster Title: **Tools for Success**

Keywords: **Recruitment, Peer Mentoring, Learning Communities, Career Counseling, Underrepresented Students**

Poster Abstract: Tools for success is a five-year project that is designed to increase the number of underrepresented minority students that are successfully completing degrees in science, technology, engineering, and mathematics (STEM). The goals of the project are to attract and recruit 60 students at the Wolfson and Kendall campuses each year, to ensure retention and graduation rates in their A.A. STEM programs, and to promote students transfer to four-year institutions. We use proven techniques such as learning communities, cohort scheduling, specialized advisement, technological tools, and scientific forums.

In our project, the pathway to completion begins with a mandatory orientation process through which each student is introduced to STEM education at Miami Dade College and each student is assigned a faculty mentor with whom an individualized educational plan is developed. Students are then enrolled in our special one-credit STEM skills courses. These courses take a holistic approach to education and are designed to improve the skills, study habits, knowledge base and discipline necessary to succeed in STEM. In addition, the final two courses in the four-course sequence provide one-on-one advisement as the program participants engage in career exploration and apply to upper-division institutions, scholarship and internship opportunities. Each student receives \$1000 annual service award, the latest Apple iPod Touch to facilitate the technology requirements in each of our courses, and the opportunity to earn a \$2000 transfer scholarship upon graduation. While only 27% of Miami Dade College's STEM majors complete their degrees within a three year period, approximately 70% of Tools for Success students complete their degrees within a two year period.

Tools for success brings together the faculty, administration, and scientists from the community to nurture underrepresented students who may otherwise not be able to succeed in STEM fields. The project is innovative in that it is not merely a scholarship program, but a scientific learning community that truly focuses on preparing students for success.

Poster #: 3 – 29 Session: C Lead Institution: **Michigan State University**

Authors: **Thomas Wolff** **Claudia Vergara**
 Daina Briedis **Colleen McDonough**
 Neeraj Buch **Ruth Heckman**
 Jon Sticklen **Cliff Weil**
 Mark Urban-Lurain **John Courtney**
 Renee Degraff **Wolfgang Bauer**

| | | | | | |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Engineering | Year 2 | Type 1A | 0757020 | MI |

Poster Title: **Engaging Early Engineering Students (EEES) at Michigan State University and Lansing Community College**

Keywords: **Peer Tutoring, Peer Mentoring, Supplemental Instruction, Institutional Change**

Poster Abstract: Early “leavers” from engineering programs typically fall into one of two overlapping categories: (a) those who leave because of academic difficulties and (b) those who leave because they find the educational environment of early engineering to be hostile and/or not engaging. Our project, "Engaging Early Engineering Students (EEES), is a suite of four articulated programs that is designed to ease the transition of high school students into engineering undergraduate programs, and, by making the transition smoother, to increase the retention rate of early engineering students. Analysis of internal statistics has revealed key courses that are pivotal in promoting retention: early mathematics courses, first term physics, and a computational tools-for-problem-solving course.

The EEES project, consists of four content subprograms: (a) a program to provide formative assessments in the key courses with follow-on “bootstrapping” tutorials, (b) a supplemental instruction program which we call the PAL (peer-assisted learning) subproject, (c) a program to directly engage engineering faculty with early engineering students [Connector Faculty Program], and (d) a program to develop and exploit course material from one key course in another. Our effort is not a conglomeration of the four independent subprojects; rather EEES is a system of four interrelated, articulated programs that will be more effective than the sum of its parts.

We are approximately two years, six months into a five year project. Our efforts to date have focused on establishing our Connector Faculty program and our Peer Assisted Learning program. We believe we currently have evolved to workable and sustainable models for these facets of our project. Our early diagnostic followed by intervention program is well established on the diagnostic tool side, and we are moving to complete the picture by designing and implementing active interventions. And we are just starting to develop our class cross linkages project to complement our suite.

On the data analysis side, our project presents the daunting task of determining effectiveness of each of our component projects, and beyond that to determine synergisms between the projects. We have tentatively established a structural equation model (SEM) that will be used to this end.

Our project directly requires understanding of institutional change issues if it is to be successful. Our next years will focus increasing on the sustainability issues.

Poster #: 3 – 30 Session: C Lead Institution: **Western Michigan University**

Authors: **Edmund Tsang**
Paul Engelmann
Diane Anderson
Laura Darrah
Ikhlas Abdel-Qader

| | | | | | |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Engineering | Year 1 | Type 1B | 0969287 | MI |

Poster Title: **Effective Academic and Student Affairs Collaboration to Enhance Student Success in Engineering and Applied Sciences**

Keywords: **Recruitment, Peer Mentoring, Learning Communities, Career Counseling**

Poster Abstract: In the first STEP award (#0336581) between 2004 and 2009, Western Michigan University (WMU) created learning community cohorts for first-time first-year students to improve their success and retention. Students in a learning community shared 3-to-5 courses together during the fall semester and 2-to-4 courses together during the spring semester of the first year. The 2nd year retention to STEM has increased by ~8% and the 5-year graduation and retention to STEM has increased by ~10% above the historic baseline 2nd year retention rate and 5-year graduation and retention rate, respectively. During the latter portion of first-phase of the STEP award, a special-interest housing option (Engineering House) was created by Residence Life (RL) for students in the College of Engineering and Applied Sciences (CEAS). Cooperation was nurtured between CEAS and RL that resulted in the second STEP award (0969287). In the second STEP award, active collaboration is being expanded to include other units of the Division of Student Affairs, and the student target populations are being expanded to include returning sophomores and community college transfer students, in addition to first-time first-year students. New programs implemented during Year One of the second STEP grant include Engineering Peer Mentors, Summer Bridge Program, Alumni Mentoring of female students, Career Advising and Career Preparation, and the Transfer Student Host program. In addition to the student success and retention programs, the second STEP grant has a recruiting component targeting the traditionally underrepresented populations in engineering and applied sciences of females and ethnic minorities..

Poster #: 4 - 01 Session: A

Lead Institution: **University of Washington
Seattle Campus**

Authors: **Veronica Guajardo
James Dorsey
Erick Jones**

| | | | | | |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | All STEM | Year 2 | Type 1B | 0856830 | WA |

Poster Title: **Challenges and Successes in Migrating from a STEP 1A to a STEP 1B Project**

Keywords: **Recruitment, Learning Communities, Articulation & Transfer Issues, Program Evaluation, Student Tracking, Underrepresented Students, Institutional Change**

Poster Abstract: Well into year two of the STEP 1B project, this session will focus on the successes and challenges experienced during the 1st and 2nd year of the Washington MESA Community College Project (WA-MCCP). Many unforeseen challenges arose during the first and second year of this project's migration to the current MCCP model. Data collection mechanisms and the human errors that can and do occur, and campus leadership that effect program implementation, for example, became areas of challenge that required creative solutions though meetings and extensive dialog with key stake holders.

Conversely, these same challenges fostered opportunities for action regarding institutional, staff and personnel commitment, accountability, reporting, race and educational equity, and honest dialog about the challenges (perceived or actual) campus faculty and staff face when serving underrepresented STEM students who seek to transfer. Ultimately, advocacy is key and requirements such as improvement plans and a clear deliverable schedule are among the crucial strategies for implementation of a sustainable STEM project that seeks to address the gap in STEM equity.

The UW MESA team will lead an open discussion and engage participants to share collective knowledge as STEP 1B project managers, as well as offer general advice and recommendations for those seeking to transition among STEP projects. Participants should come prepared to share their own challenges, successes, and concerns for a productive workshop.

Poster #: 4 – 02 Session: B Lead Institution: **Arizona State University**

Authors: **Mary Anderson-Rowland** **Clark Van Gilder**
 Armando Rodroquez **Rakesh Pangasa**
 Anita Grierson **Jack Bailey**
 Richard Hall **Chuck Spotts**

| | | | | | |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Engineering | Year 2 | Type 1A | 0856834 | AZ |

Poster Title: **STEP Grant Challenges and Results: Motivated Engineering Transfer Students From Non-Metropolitan Community Colleges**

Keywords: **Recruitment, Peer Tutoring, Peer Mentoring, UG Research/Internship Opportunities, Supplemental Instruction, Articulation & Transfer Issues, Career Counseling, Program Evaluation, Underrepresented Students**

Poster Abstract: In Fall 2009, a National Science Foundation (NSF) STEP grant award (# 0856834) was made to support a collaboration between a Research I University and five rural (non-metropolitan) community colleges (CC). The grant followed a smaller NSF grant (# 0836050) which supported the exploration of a four-year school working with three rural CCs.

Initially, the goal of the ASU team was to work in a collaborative with non-metropolitan community colleges to help strengthen or begin an engineering program, to visit community college classrooms to excite undecided students and to encourage students already pursuing engineering, to help the CCs recruit high school students to their school in engineering, and to have the potential CC transfer students visit ASU before they transferred to ease the transfer process. We also expected to continue to support and to encourage the students through the Academic Scholarship Program and the METS Center after they transferred. In addition, we wanted as many as possible of these transfer students to go right on to graduate school full-time after they graduated with a Bachelor’s degree. We believe that we are continuing to accomplish these expectations.

The primary challenge was known before the project began: only one school is within an hour’s drive of the four-year institution. The other four schools are three to four hours distant. In spite of this, strong collaborations and interactions are occurring between the schools. The initiation expectations were a bit different for each community college and the progress has been different at each school.

By all reports, the partnership is doing well and students at the community college are getting excited about engineering. The cooperation among the CC and ASU representatives, CC staff, and CC instructors has been outstanding. It has also been gratifying to see the CCs help each other. Mohave College is in the process of establishing an engineering program. Central and Cochise have recently gone through setting up new courses and are helping them with content, texts, and ideas. The Academic Associate Dean of the Ira A. Fulton School of Engineering has also assisted Mohave with their materials for setting up the program. This Dean sits on the Equivalency Guide Committee, the committee that needs to approve these materials.

As Dr. Richard Hall of Cochise stated: This partnership will always be challenged with the time and distance between Cochise County (and the other community colleges) and Metro Phoenix. This is a challenge that we continue to work on because students benefit from our continued efforts to build the program.

This project is leveraged by three S-STEM grant programs. In the past two years, the retention and graduation rates of the upper division transfer students in the S-STEM program have been 95%. This rate is in contrast with the overall 70% graduation rate for upper division transfer males and 60% rate for upper division transfer females in engineering. The engineering and computer science enrollment in Arizona community colleges is up for Fall 2010 (9% in Maricopa County) and the number of Fall 2010 engineering transfer students at the university has increased over 50% from Fall 2009. The program is doing well.

Poster #: 4 - 03

Session: C

Lead Institution: **Eastern Arizona College**

Authors: **John Bailey**
Phil McBride

| | | | | | |
|-----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Two Year | Engineering | Year 2 | Type 1A | 0856635 | AZ |

Poster Title: **Motivating Engineering Transfer Students - STEP (METS-STEP)**

Keywords: **Recruitment, Learning Communities, Articulation & Transfer Issues**

Poster Abstract: Eastern Arizona College is partnering with Arizona State University in an effort to better motivate transfer students and to increase the number of students who elect engineering as their transfer degree. Our approach is to build on some of the infrastructure developed by ASU in an earlier grant, applying portions of that infrastructure to our campus. This translates to a series of visits to the ASU campus in Tempe and visits by ASU faculty to our campus in Thatcher, Arizona. We have also increased efforts toward building closer comraderie among our engineering students, thru an engineering club. High school outreach, is planned for the spring of each year, in the form of an "Engineering Day" for local high school students. Results to date include an increased number of students declaring engineering as their major, and improvement in overall engineering enrollment.

Poster #: 4 - 05 Session: B Lead Institution: **University of Texas at Dallas**

Authors: **Dave Galley**
John Sibert
Gerald Suggs

| | | | | | |
|-----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Two Year | All STEM | Year 2 | Type 1A | 0856549 | TX |

Poster Title: **The Dallas STEM Gateways Collaborative**

Keywords: **Peer Tutoring, Peer Mentoring, Learning Communities, Articulation & Transfer Issues, Faculty & Staff Development**

Poster Abstract: The University of Texas at Dallas, Collin College, and Richland College of the Dallas County Community College District have established a joint effort, the Dallas STEM Gateways Collaborative, to increase significantly Science, Technology, Engineering, and Mathematics (STEM) student learning and the number of undergraduates receiving STEM degrees at the three institutions. Building on previous collaborative activities, taking advantage of the concentration of high tech businesses in the Dallas-Fort Worth Metroplex area, and using documented best-practice methods, the program makes use of a combination of strengthened recruitment, student mentoring and professional development, internships, undergraduate research opportunities, faculty development, and curricular alignment and enhancement to produce over a five-year period a cultural change that will lead to sustained high productivity of undergraduate STEM degrees at these institutions. The Dallas STEM Gateways Collaborative program will enhance the number, quality, and diversity of undergraduates successfully earning STEM degrees.

The program elements include:

1. Expansion of the successful 2+2 articulation program in engineering (including important curricular alignment agreements) between Collin College, Richland College and UT Dallas to all STEM disciplines at both Richland College and Collin College, including enhanced advising at the community colleges.
2. A collaborative recruitment effort to make the 2+2 programs known to high school juniors and seniors in the diverse Dallas-Fort Worth Metroplex.
3. A significant expansion of the Peer-Led Team Learning (PLTL) program at UT Dallas.
4. Collaborative activities among the three institutions to build a STEM student learning community. These activities include opportunities for undergraduate research and internships, joint student organization activities, an undergraduate research fair, and STEM mentoring and career workshops.
5. Collaborative activities involving faculty grant awards to promote innovations in STEM teaching and learning.
6. Articulation between UT Dallas and the community colleges to bring more students into the UTeach Dallas program.
7. Close links with the UT Dallas Gateways for Excellence in Mathematics and Science (GEMS) program to improve student retention and learning in the first and second years at the university.
8. A significant assessment and evaluation effort to document best practices and to provide formative assessment for the program.

Authors: **John Idoux** **Daniel Spencer**
Angela Hochhalter **Sarina Swindell**

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 2 | Type 1A | 0855343 | TX |

Poster Title: **"The Central Texas 2-STEP: 1)Attraction TO STEM; 2) Retention & Graduation IN STEM"**

Keywords: **Recruitment, Math Preparation, UG Research/Internship Opportunities, Career Counseling**

Poster Abstract: "The Central Texas 2-STEP" project, a partnership involving Tarleton State University, Texas A&M University-Central Texas (comprehensive institutions) and Temple College (a community college), is increasing STEM graduation rates through targeted recruitment of two distinct audiences. The first audience is high school juniors and seniors studying in residence at The Texas Bioscience Institute's (TBI) "Middle College" (a unit of Temple College). Students enroll in a STEM-intensive college curriculum that also satisfies high school graduation requirements. Students are counseled and encouraged to enroll in sufficient transferable STEM courses such that they receive an Associate Degree along with their high school diploma. Upon graduation they are encouraged to pursue a STEM bachelor's degree. The second targeted audience is recent and soon-to-be veterans from the armed services. This arm of the program capitalizes on significant improvements in the GI Bill to reach veterans and/or their dependents who have expressed an interest in STEM careers.

Students participating in "The Central Texas 2-STEP" program are being supported by a number of measures shown to increase student interest and persistence in STEM fields. Undergraduate research opportunities, seminars with practicing STEM professionals, and meaningful career counseling are all project components designed to retain students and to prepare them for careers in STEM. A math-readiness summer experience is also being conducted for promising STEM students who may need extra support before they begin their university studies.

Some highlights of the 2010-2011 year of "The Central Texas 2-STEP" project are:

- During Summer 2010, twenty-four (24) of the TBI "Middle College" students participated in a full-time, 10-week undergraduate research experience. Each student was an active member of an investigator-led research team and worked on a single project within the particular team's research program. All received 2 credit hours for their Undergraduate Research Experience course, which culminated with presentations of professional posters based on their work. When surveyed at the conclusion of the program, students reported that the experience had increased the likelihood they would pursue a career in Science (84%) and Technology (50%) either "a little" or "a lot." Twenty students who participated are pursuing and four will pursue (upon completion of high school) baccalaureate degrees in STEM areas. The research experience program will be offered again in Summer 2011.
- The initial Math-Readiness Summer Workshop was held in Summer 2010. The Workshop was a five hour/day, four day/week experience held from early June to early July. The content of the Workshop was designed specifically to assure that rising high school juniors wishing to matriculate at the TBI in the Fall would have the appropriate mathematical preparation to successfully 1) undertake College Algebra and/or 2) perform the mathematical requirements of the first two introductory "gatekeeper" college science courses (i.e., "freshman" Biology and Chemistry). Seventeen students attended the initial Workshop. Ten of those students began studies at the TBI in Fall 2010; three successfully completed the Workshop but did not enroll at the TBI; one did not complete Workshop; two completed the Workshop but did not achieve sufficient scores to allow enrollment at the TBI; one student completed the Workshop, but moved from the area. Only one of the junior students who began their studies at the TBI in Fall 2010 did not, for academic reasons, return for the Spring 2011 semester. The Math-Readiness Workshop will be offered again in Summer 2011.
- Twelve seminar (research- and practice-based)/career counseling sessions were presented to the students during the 2010-2011 year. Practicing STEM professional from the following fields made presentations: Functional Neuroimaging Biology, Organic Chemistry, Biochemistry/Immunology, Molecular Genetics, Molecular Immunology, Mathematics, Microbiology, Clinical & Therapeutic Pharmacy, Photochemistry, Cognitive and Biological Psychology, Plastic Surgery. In addition, twelve alums of the Summer 2010 Research Experience Program spoke to the students about their participation in the Program, their research projects and their overall academic experience in the Program.
- Approximately one hundred and fifteen "Middle College" students were enrolled at the TBI during the 2010-2011 year. Eighteen of the twenty-three "2nd year senior Middle College" students will receive a STEM-intensive Associate's Degree from Temple College, while simultaneously having fulfilled all requirements to receive their high school diplomas. All of the "other senior Middle College" students will have completed a significant number of credits in transferable STEM courses; and forty of the forty-two "senior Middle College" students have indicated their intention to enroll in a STEM baccalaureate degree program in Fall 2011.
- Four military-related students (military spouses) who already had baccalaureate degrees completed enhanced biotechnology certificate studies at the TBI during the 2010-2011 year and two retired military students began their preparatory studies for the AAS Program in Biotechnology.

Poster #: 4 - 07

Session: A

Lead Institution: **Chicago State University**

Authors: **Rachel Lindsey
LeRoy Jones II
Lezlie Thompson
Austin Ferguson
Arlicia Corley**

| | | | | | |
|---------------------------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Multi-school Partnership | All STEM | Year 2 | Type 1A | 0856827 | IL |

Poster Title: **Urban Science, Technology, Engineering, and Mathematics Talent Expansion Program (USTEP)**

Keywords: **Recruitment, Peer Tutoring, UG Research/Internship Opportunities, Student Tracking, Underrepresented Students**

Poster Abstract: Chicago State University (CSU) and two City Colleges of Chicago (CCC), Kennedy-King and Olive-Harvey, have formed a partnership to increase the number of students persisting in STEM majors by focusing directly on the quality of student learning. The vision of USTEP is to significantly increase the number of first and second year CSU and CCC college students who enter, pursue and graduate from science, technology, engineering and mathematics (STEM) programs. In order to achieve this vision, these three Chicago commuter schools have implemented a student-centered academic support and research program. The goals of this program are to enhance undergraduate education and training at the intersection of the biological and physical sciences and mathematics, to prepare students to graduate, and to pursue graduate study or careers in traditional and emerging fields that integrate the sciences. USTEP aims to broaden undergraduate research capacity and experiences by utilizing CSU's local prairie garden for environmental and ecological field research and data collection. Student support will be provided through cohort class participation, faculty and peer workshops, group study, seminars, and hands-on instruction in science and mathematics. These activities will enhance our capacity to provide excellence in undergraduate research experiences for an increased number of students. Thus far the results of this study focus on the recruitment and retention activities of traditionally under-represented students, and the research activities conducted in CSU's local prairie garden in the summer 2010.

Poster #: 4 – 08 Session: B Lead Institution: **California State University - Fullerton**

Authors: **Mark Filowitz** **Cathy Fernandez-Weston**
 Carol Comeau **Ricardo Lopez**
 Larry Redinger **Rochelle Woods**
 Martin Bonsangue **Sean Walker**

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 3 | Type 1A | 0757113 | CA |

Poster Title: **TEST:UP: Talent Expansion in Science and Technology-An Urban Partnership**

Keywords: **Recruitment, Math Preparation, Peer Mentoring, UG Research/Internship Opportunities, Supplemental Instruction, Learning Communities, Career Counseling, Introductory Courses, Program Evaluation, Research Projects/Type 2, Underrepresented Students, Institutional Change**

Poster Abstract: TEST:UP is a collaborative program, initiated in fall 2008, among three urban institutions— California State University, Fullerton (CSUF), a four-year, comprehensive university, and Mt. San Antonio College (Mt. SAC) and Santa Ana College (SAC), two of CSUF's primary feeder two-year community colleges. Our vision is that TEST:UP will result in a collaborative model of cooperation between two- and four-year institutions to yield significantly more STEM students and graduates. To accomplish the goals of TEST-UP, four strategies were implemented: 1) to improve counseling, guidance, and mentoring opportunities and improve information and knowledge of STEM careers for Mt. SAC and SAC STEM and potential STEM students; 2) to develop support networks on all three campuses, including facilities and programs to develop learning communities, both to facilitate the transfer of STEM students to CSUF and to provide tools to encourage their success; 3) to strengthen student learning (and therefore student success) in pivotal math and science introductory discipline courses by developing and funding supplemental instruction (SI) programs on all three campuses; and 4) to develop a teaching intern/mentoring program for CSUF graduate students interested in seeking two-year college teaching careers. Intermediate indicators of success are apparent in the first three goals, despite the ongoing budget crisis in California that has resulted in fewer enrollments and a large reduction in STEM class offerings in most of California's colleges and universities.

Despite these budget issues, the number of STEM transfer student graduates from CSUF showed an upward trend since the implementation of the program; moreover, there has been some success in maintaining both the number AA degrees awarded as well as the number of transfers to four-year universities, including CSUF. The CSUF, Mt. SAC and SAC STEM advisers are actively encouraging student involvement in TEST:UP programs, advising students, and collaborating with existing student clubs and programs. Progress was made to more fully integrate STEM Advisers with regular academic services on all three campuses, and to more actively involve STEM faculty in TEST:UP activities. Pre-transfer and post-transfer surveys were developed aimed at establishing demographics, assessing preparedness for transfer to a four-year institution, and identifying key stumbling blocks in the STEM transfer process, as well as to identify and assess strengths and weaknesses in the STEM transfer process. An on-line Early Warning System was developed to identify at-risk students in the CSUF College of Natural Sciences and Mathematics (NSM) and the College of Engineering and Computer Science (ECS) within their first semester at CSUF.

Retention rates for first time STEM freshmen students in the College of NSM have increased from 59.0% to 68.4% since 2007 and in the College of ECS retention has increased from 50.8% to 67.8%. Although other external factors in addition to TEST:UP may have contributed to this increase, there is evidence indicating that TEST:UP is having a direct impact. We implemented SI programs using the University of Missouri-Kansas City model at CSUF and SAC. Mt. SAC had already implemented SI using this model prior to the grant and is using TEST:UP funds to expand SI workshops into additional STEM disciplines. Results to date indicate that improvements in student performance with SI are meeting expectations as indicated by improved grade point average improvements and passing rate improvements in key gateway STEM courses. Through the end of the fall 2010 semester, data available indicates improvements in both passing rates and grades at all three institutions when students attend at least three sessions of SI. We hope to demonstrate that the use of SI in STEM courses improves graduation rates and retention in STEM majors so that we can economically justify the institutionalization of these activities.

Poster #: 4 – 09 Session: C Lead Institution: **Pennsylvania State University – Main Campus**

Authors: **Renata Engel**
Dhushy Sathianathan
Janice Margle
Javier Gomez-Calderon
Amy Freeman
Catherine Cohan

| | | | | | |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Engineering | Year 3 | Type 1A | 0756992 | PA |

Poster Title: **Toys and Mathematical Options for Retention in Engineering (Toys'n MORE): Initial implementation of the four intervention strategies**

Keywords: **Math Preparation, Supplemental Instruction, Introductory Courses, Student Tracking, Underrepresented Students**

Poster Abstract: The Pennsylvania State University Toys and Mathematical Options for Retention in Engineering (Toys'n MORE) project has completed three semesters of data collection. This poster presents preliminary data for the first two semesters. The goal of the project is to increase the retention of STEM students enrolled in 15 regional Penn State campuses. These campuses offer associate and bachelor STEM degree majors, including the first two years of many STEM degree majors offered at Penn State's main campus at University Park. The study is comprised of three intervention strategies and an assessment strategy. The strategies include (a) tutoring programs for foundational math courses in algebra, trigonometry, and calculus; (b) a freshman toy-based design course called Toy FUN-damentals in which dissection and re-design of toys is used to engage students in a positive environment; (c) new math-intensive summer bridge programs at three regional campuses to assist incoming underserved students who are interested in engineering make the transition from high school to college; and (d) the assessment and evaluation of the intervention strategies. After the first two semesters, a total of 6,222 students were enrolled in the three interventions. Fifty math faculty and twenty engineering faculty were involved. The preliminary results look promising. The STEM retention after one year (2009-2010) was 80% compared to 67% for the comparison period prior to the intervention (2003-2008). The passing rates in algebra, trigonometry, and calculus (percentage of students receiving grades of A, B, or C) after two semesters improved by 8%, 9%, and 15%, respectively, compared to the pre-study period. Freshman in the toy-design course reported increases in engineering efficacy, that is feeling competent to complete an engineering degree. After the first iteration at three campuses (summer 2010), the summer bridge students' fall 2010 semester GPA was 3.02 compared to a 2.72 fall semester GPA among similar students at those campuses who did not participate. A next step includes formal data analysis to evaluate the changes we've measured. The Toys'n MORE team is confident the strategies are on track to meet the overall broad impact goal to increase STEM majors by 10% at the Pennsylvania State University.

Poster #: 4 - 10 Session: A

Lead Institution: **Bowling Green State University**

Authors: **Moira van Staaden**
Anne Bullerjahn
Tracy Huziak-Clark

| | | | | | |
|---------------------------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Multi-school Partnership | All STEM | Year 3 | Type 1A | 0757001 | OH |

Poster Title: **SETGO: impacting inter-institutional communication, culture, & change.**

Keywords: **UG Research/Internship Opportunities, Learning Communities**

Poster Abstract: SETGO is a 2-/4-year partnership which aims to foster student retention and academic success across all STEM fields, and to facilitate their transition from Associate programs at Owens Community College to Baccalaureate degree programs at Bowling Green State University. Primary program components are threefold. Owens Ready Bridge (ORB) - a non-residential summer bridge program designed to mitigate poor academic preparation and address issues related to transitioning to the university; SETGO Summer Research (SSR) - authentic research work in a 10-week summer program provides the peak experiences that carry students through the challenges of meeting academic standards; Art of Science Community (ASC) - parallel monthly meetings centered on 'Building a Better Environment' are a point of convergence for diverse scientific interests, highlight the value of interdisciplinary research, and provide opportunity for cascading mentor relationships.

All three components have been successfully implemented. The ASC umbrella activity unifies faculty and student participants from OCC/BGSU as well as the general public with total unduplicated head counts of 338 thus far. 36% of STEM faculty in the College of Arts and Sciences (BGSU), are involved as SSR mentors. While participation is still heavily dominated by the Life Sciences, strong student interest is driving faculty participation and we have steadily increased participation from Computer Science and Technology in particular. Although recruitment into the ORB increased from 21 in year1 to 30 in year2, recruiting direct from high school students in their "senior summer" remains the greatest challenge for the summer bridge program, which is currently at 53% of target capacity.

We previously showed a measurable impact of program mentoring on student attitude change; specifically, enhanced student confidence in their ability to master academic content, in their decision to complete a degree in STEM, and in their identification with the institution. These early indicators are now translating into increases in retention, performance, and graduation. Immediately prior to SETGO, the one-year retention rate of freshman in STEM disciplines was 78.8% at BGSU. Comparison groups established for all ORB and SSR participants were matched for age, sex, ethnicity, ACT, and major. SETGO participants have a higher retention rate, lowered rate of switching to non-STEM areas, better performance as judged by cumulative GPA, and a higher graduation rate than do students in comparison groups. Moreover, following participation in SSR, 26% of students continued working in their mentors' labs either as volunteers or for research credit. 25 of the first two cohorts (i.e. 32%) have graduated and are in quality graduate programs or the STEM workforce. Qualitative data suggest that this is attributable, in part, to cascading mentoring, presentations in SSR weekly meetings, the ASC, and the Research Roundup at the end of the SSR.

Enhanced institutional awareness of, and responsiveness to, the needs of STEM and transfer students has also resulted in some indirect effects; specifically, increased STEM recruitment at BG and STEM transfer from OCC. 6-Yr graduation rates in STEM have improved steadily at BGSU over the course of this project (from 44 to 60%) with a total of 86 added graduates above baseline. Over the same time period, the 3-yr graduation rate at OCC has fluctuated between 2.6% and 12.2%, with a sum total of 22 graduates. We anticipate that both graduation and transfers from OCC will begin to accelerate with the implementation of reverse transfer procedures.

Authors: **Diane Rover**
Steve Mickelson
Frankie Santos Laanan
Mack Shelley
Monica Bruning
Harry McMaken
Mary Darrow

Joel Johnson
Marcia Laugerman
Andrew Ryder
Kim Linduska
Michael Lentsch
Randy Mead
James Stick

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|---------------------------------|---------------------|---------------|----------------|----------------|-----------|
| Multi-school Partnership | Engineering | Year 4 | Type 1A | 0653236 | IA |

Poster Title: **SEEC: Student Enrollment and Engagement through Connections**

Keywords: **Recruitment, Peer Mentoring, Learning Communities, Articulation & Transfer Issues, Career Counseling, Introductory Courses, Faculty & Staff Development, Program Evaluation, Institutional Change**

Poster Abstract: The Student Enrollment and Engagement through Connections (SEEC) project is a collaboration between Iowa State University and Des Moines Area Community College (DMACC). The project's goal is to increase the number of engineering graduates at Iowa State by 100 per year, to approximately 900 graduates annually. Included within this goal are increases in the percentages of women and minority graduates in engineering at Iowa State and the number of pre-engineering students at DMACC. The number of new engineering majors shaping Iowa State's 2012 graduating class is about 1,450; thus we expect to achieve the target of 900 engineering graduates in the class of 2012.

Iowa State has seen increasing new student enrollment in engineering (freshmen and transfer students) during the project. New enrollments for fall semesters from 2008 through 2010 were, respectively, 1469, 1575, and 1758. Of the additional new students in 2010 compared to 2009, about one-third were transfer students. The number of new transfer students from Iowa community colleges has steadily risen from 119 for AY 2007-08, to 137 and 154 for AYs 08-09 and 09-10, respectively. The number for fall 2010 (not including spring 2011) was 149. Ethnic minority numbers and percentages among new students remained about the same. Female numbers among new students increased slightly, due to an increase in the number of women transfer students, while the percentage dropped about 1%. Engineering has also seen a significant improvement in first-year retention of Iowa community college students. The five-year average for learning community retention from 2000-2004 was 77.5% for students direct from high school and 55.3% for Iowa community college transfer students. From 2005-2009, the percentages are 75.5% and 73.6%, respectively.

Project objectives are designed within the areas of learning communities, curriculum, advising, networking, and evaluation. Activities have been planned in each of these areas using a logic model approach that identifies resources, outputs, outcomes, and impact. Highlights resulting from this process include the creation of a transfer-friendly environment, a community of practice through partnerships, greater awareness about engineering and engineering careers, student-faculty interaction related to the engineer of 2020, and new datasets for research and evaluation.

Transfer students are supported prior to entering Iowa State through the Engineering Admissions Partnership Program (E-APP), created in 2008 as a SEEC project initiative. Pre-engineering community college students who sign up for Iowa State's Admissions Partnership Program (APP) are invited to join the E-APP Learning Community. This virtual learning community connects students to Iowa State's College of Engineering faculty, staff, and students through multiple channels. A special initiative with DMACC created an engineering orientation course, EGR 100, now offered at several DMACC campuses. DMACC student enrollment in EGR 100 has increased from 13 in AY 2007-08 to 34 and 39 in AYs 2008-09 and 2009-10, and was 32 for fall 2010. EGR 100 provides pre-engineering students with a broad overview of engineering and general information about the transfer process to a four-year institution. Now that the class is established, DMACC advisers are working to guide pre-engineering students into EGR 100 their first or second semester.

Efforts to measure and document the "SEEC Effect" are underway. Specifically, the research design includes quantitative (e.g., student performance data, survey research) and qualitative methodological (e.g., focus group interviews) approaches. For example, in relation to transfer student success, various background characteristics, academic data, and student experiences are being analyzed and compared with specific attention to SEEC treatments, such as DMACC's pre-engineering orientation course and Iowa State's E-APP program.

More information about project activities are available at the following websites, including SEEC's partnership with ISU Extension to reach out to communities across Iowa, and engineer of 2020 curriculum development in coordination with an NSF S-STEM grant: <http://www.eng.iastate.edu/seec/>, <http://www.eng.iastate.edu/seec/newsletter.shtml>, and <http://www.eng.iastate.edu/e2020/>.

Poster #: 4 - 12 Session: C Lead Institution: **Mid-South Community College**

Authors: **Barbara Baxter**

| | | | | | |
|-----------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Two Year | Engineering | Year 5+ | Type 1A | 0622312 | AR |

Poster Title: **Arkansas Delta Science, Technology, Engineering and Mathematics Talent Expansion Project (ADSTEP)**

Keywords: **Articulation & Transfer Issues, Underrepresented Students, Introductory Courses**

Poster Abstract: The five-year ADSTEP project seeks to (1) recruit more students to STEM fields with an emphasis on under-represented minorities and those not usually considered by their high school counselors as STEM candidates, (2) create career pathways in advanced manufacturing technology and information technology aligned with industry requirements, and (3) model how community colleges, in partnership with a university and local school districts, can provide a systemic solution to the historic under-representation of minorities in STEM. Each college has a grant-funded, recruiter/counselor dedicated to the program who is charged with recruiting/mentoring students and with forging proactive partnership with high school personnel to support student success. Project students remain in their home high schools and take targeted college courses in manufacturing, welding, renewable energy, and information technology offered by the partner community colleges for concurrent high school and college credit.

Currently in its fifth year, the project has developed a variety of activities to increase awareness of STEM careers and a variety of retention strategies to help students succeed academically.

To date, 964 high school students have been enrolled in technical center programs with semester retention rates of 76% to 100%. For partner colleges reporting as of January 2011, the college matriculation rates for students entering the high school technical center program in Fall 2007 and in Fall 2008 are as follows:

2007 2008

College #1: 43% 27%

College#2: 0% 25%

College#3: 73% 78%

College#4: 5% 21%

Reported college retention rates for 2007 students range from 44% to 60% to date; and for 2008 students, 85% to 91% through their first semester of enrollment. Only one project student has completed an associate's degree to date, which is explained, in part, by the large number of students who enroll part-time, but which also indicates a need for on-going support and academic counseling for students.

No project students are ready for upper division courses in the Bachelor of Applied Science or the BS in Information Technology offered by the University of Arkansas at Fort Smith, but 57 other students have taken advantage of the programs which would not be available without this grant program.

Best practices identified by the project include the recruiter/counselors working with high school counselors and students to develop a 2 to 4 year academic plan to encourage retention to goal completion, engaging students each week in active learning strategies, workplace ethics, career planning, math and communication skills improvement, and academic advising. The partner colleges with the highest success rates are also those which have provided direct assistance to students in completing college and financial aid applications and maintained close communication with students' high school counselors. Other activities which have proven to support retention and success include bringing students to the college campus for their technical courses, supporting students in competitions, such as Skills USA and BEST Robotics to demonstrate their achievements and providing shirts and lab coats as marks of distinction which students can wear at their home high schools.

Three of the main challenges the project has encountered are 1) developing seamless articulations between associate of applied science degrees and baccalaureate programs, which has been achieved with the Bachelor of Applied Science; 2) maintaining viable relationships with public schools despite funding problems and personnel turnover, and 3) sustaining mentoring relationships with students once they have completed the high

Authors: **Hedley Freake**
Steven Zinn
Marcia Jehnings
Melissa Philion
Diba Khan-Bureau

| | | | | | |
|---------------------------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Multi-school Partnership | Science | Year 5+ | Type 1A | 0525379 | CT |

Poster Title: **STRONG-CT – a dynamic partnership between two and four year institutions**

Keywords: **Peer Mentoring, Articulation & Transfer Issues, Program Evaluation, Underrepresented Students**

Poster Abstract: Science and Technology: Reaching Out to New Generations in Connecticut (STRONG-CT) is a local academic collaboration in the northeastern United States centered on the enrollment, retention, and graduation of first generation and historically underrepresented students in the life sciences. Currently in its sixth year (no cost extension), student membership is at approximately 125, two-thirds at UConn and the remainder spread over three neighboring community colleges. STRONG-CT generates a range of programming designed to support the academic development of its scholars, including one-credit enrichment courses, tutored learning groups centered on core science and math courses, individualized advising, mentoring relationships and large group science-based activities. Despite leaving high school with lower math and verbal SAT scores, STRONG-CT student GPAs are not different from those of other science students at UConn and are on average a quarter of a point higher – both in overall GPA and specifically science GPA – than those of students with similar backgrounds who declined to enroll in the program. An online survey constructed to assess students’ standing on relevant psychological and social criteria demonstrated that STRONG-CT students have higher confidence in achievement and learning, higher commitment to attaining a degree, and greater commitment to the sciences than their peers. The transition from community college to university continues to be challenging for many of our students, particularly those who are not able to study full-time. While budget crises continue to affect the institutionalization of the program, a Guaranteed Admissions Agreement, effective relationships with permanent academic offices and the establishment of a number of integrative science courses will continue to facilitate the pursuit of science at all participating institutions.

Poster #: 4 – 14 Session: B Lead Institution: **University of Nebraska - Lincoln**

Authors: **David Jones**
Lance Perez
John Sutton
Lyn Swackhamer
Carmen Zafft

| | | | | | |
|-------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Engineering | Year 5+ | Type 1A | 0622274 | NE |

Poster Title: **Strengthening Transitions into Engineering Programs (UNL S.T.E.P.)**

Keywords: **Articulation & Transfer Issues, Introductory Courses**

Poster Abstract: The University of Nebraska-Lincoln’s (UNL) College of Engineering (COE), in partnership with Nebraska’s six community colleges, is endeavoring to increase the number and success of community college (CC) transfer students in engineering. This effort is leveraged through the National Science Foundation Strengthening Transitions into Engineering Program (STEP). The core objective of this project is accomplished by building an effective and recognizable pathway which includes the coordination of selected courses at each CC and academic, social and professional support for transfer students. The project has two primary components: (1) development and implementation of four introductory engineering courses taught at the CCs and will transfer to the COE, and (2) establishing a set of student supports that facilitate mentoring, community building, and retention at the COE.

To date, 174 students have benefitted from STEP along with 247 students (multiple enrollments) who have taken at least one of the four STEP courses at the CC. Furthermore, as of the 2011 spring semester, a total of 93 engineering transfer students completed the engineering transfer seminar which was designed as a way to establish the aforementioned student supports. Key findings include students’: (1) above average interest in pursuing specific engineering goals, (2) above average feelings of support and ability to overcome barriers to pursuing an engineering degree, (3) above average levels of self-efficacy and outcome expectancy for pursuing engineering careers and completing engineering goals, (4) display of high to moderate levels of confidence for completing typical engineering problems, and (5) the COE recording slight increases in the number of transfer, female, and minority students from 2008 – 2009.

A significant challenge has been the matriculation of students from the CC to the COE. To date, less than 25% of CC students who have participated in the STEP pathway have transferred to the UNL COE. We are assessing this challenge and the factors that directly and indirectly impact the successful transfer of students to the COE.

Poster #: 4 – 15 Session: C Lead Institution: **University of California - Berkeley**

Authors: **Chris Lever**
Lynn Huntsinger
Seti Sidhardta
Bernadette Chi

| | | | | | |
|-------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | All STEM | Year 5+ | Type 1A | 0622598 | CA |

Poster Title: **The Environmental Leadership Pathway (ELP) of the University of California, Berkeley**

Keywords: **UG Research/Internship Opportunities, Recruitment, Underrepresented Students**

Poster Abstract: The program is a one-year comprehensive academic enrichment program targeting low income, first in the family, and/or underrepresented minority community college students who intend to transfer to competitive four year universities in science, technology, engineering, or math (STEM) majors. It is a two-year/four-year partnership with Contra Costa Community College. The goal of ELP is to broaden the community of science by improving STEM major transfer and graduation rates.

The program has three components on the Berkeley campus, each of which provides students with financial support: an environmental science research methods course in the Spring, a two month summer research internship, a teaching and learning environmental science course, and a series of transfer workshops in the Fall. Participants also attend a cohort-building field camp, and receive continuous advising and mentoring. The program creates a strong peer support group each year, and connects previous and future cohorts.

Now in its fifth year, 94 students have participated so far. The current cohort of 26 began in January 2011. Of the 67 students that have completed a full program year, 37 are enrolled in 4-year institutions, most at Berkeley, while the remaining 30 students are waiting for acceptance notifications or completing required coursework. All ELP participants are low income: 79% are first generation college students; 59% are female; 31% Hispanic; 11% African American; and 3% Native American. Evaluations indicate that students highly value the peer cohort.

Graduation and enrollment rates for students in our target population overall are low at Berkeley, and overall are not keeping up with the increase in STEM majors on campus. Although our cohorts are small, the proportionate impact in some majors may be greater than 100%. As our students progress one challenge is to track and evaluate the impact of our transfers. Faculty have been influenced by hosting ELP interns. Interest in hosting and supporting ELP students has grown, with faculty writing ELP support into grants. This year we will initiate a roundtable for research mentors, as the quality of mentorship has been shown to be critical. Last year we began a collaborative evaluation program with two other STEP programs, in order to increase the sample size for internship evaluation.

Recruiting enough students was initially a challenge for ELP. The program was re-organized and outreach was expanded to 12 more community colleges and our applications have increased more than ten-fold. Last year a policy began encouraging alumni to act as program “ambassadors” when they return to their home campuses for their final semester of coursework.

Poster #: 4 - 16

Session: A

Lead Institution: **Stonehill College**

Authors: **Louis Liotta**
Kendra Twomey
Magdalena James-Pederson
Craig Almeida
Bonnie Troupe

| | | | | | |
|---------------------------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Multi-school Partnership | Science | Year 5+ | Type 1A | 0622540 | MA |

Poster Title: **A Public - Private Partnership to Increase Enrollment, Retention, and Diversity in the Sciences**

Keywords: **Peer Tutoring, UG Research/Internship Opportunities, Articulation & Transfer Issues, Introductory Courses, Student Tracking, Underrepresented Students**

Poster Abstract: The Stonehill College – Massasoit Community College joint STEP grant project began in October of 2006 and is now in its fifth year. The goals of the project were to attract more students to science majors at Stonehill College and to the science transfer track at Massasoit, to reduce the average attrition rate of science students at Stonehill College, and to increase the number of underrepresented students in STEM degree programs at Stonehill College. The initiatives of this project were concentrated in six main areas: 1) theme-based, active-learning General Chemistry I courses; 2) early research experiences; 3) enhanced mentoring, tutoring, and advising; 4) a summer bridge program; 5) science career exploration; and 6) AP chemistry and biology laboratory enhancement. Progress to date and efforts to institutionalize and sustain the successful aspects of this project in all six areas will be reported. Specifics include the establishment of theme-based General Chemistry courses; the selection, recruiting, and experiences of STEP Summer Research Scholars; enhancement of the science tutoring program at Massasoit Community College; the development of enhanced science transfer advising activities at Massasoit Community College; the impact of the Summer Bridge Program at Stonehill College, and observations about AP Chemistry and Biology laboratories on area high school students. Overall, science enrollments and retentions have improved dramatically; however, the recruitment and retention of a more diverse student body to take full advantage of these programs has been particularly challenging

Poster #: 4 - 17 Session: B Lead Institution: **CUNY Kingsborough
Community College**

Authors: **Arthur Zeitlin
Ronald Eckhardt
Loretta Brancaccio-Taras**

| | | | | | |
|-----------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Two Year | Science | Year 5+ | Type 1A | 0525370 | NY |

Poster Title: **"The Brooklyn Gateway- A collaboration of a Two-Year and a Four-Year College to Improve Undergraduates Student Retention in STEM Programs"**

Keywords: **UG Research/Internship Opportunities, Peer Mentoring, Peer Tutoring, Learning Communities**

Poster Abstract: The Brooklyn Gateway attempts to improve student retention in Biology 1 and 2, and Chemistry 1 and 2 (Gateway Courses) at the 2-year College, and Comparative Physiology (Gateway Course) at the 4-year college, and to improve graduation rates in STEM programs. It is a collaborative project between Kingsborough Community College (KCC) and Brooklyn College (BC), two units of the City University of New York. The program's keystone is the use of Peer-Led Team Learning (PLTL) and small class sections. Student stipends, tutoring, field-trips to local science facilities, and available research projects for team leaders constitutes our Immersion Program. The PLTL technique is used in biology and chemistry sections at Kingsborough and in comparative physiology and organic chemistry I during the regular fall and spring semesters. The program began during the 2006 winter module. Both peer leaders and gateway students have been engaged in faculty-directed independent research projects. The results of these projects have been presented at both regional and national scientific conferences, with many of our students receiving awards for their presentations. Analysis of our results indicate improvement in student retention, increased enrolment in advanced biology elective courses at both the community and senior colleges and a significant increase in graduation rates of STEM students at the community college level. There has also been a definite increase in the transfer rate of STEM students to senior colleges.

Poster #: 4 - 18 Session: C Lead Institution: **University of Virginia – Type 1A**

Authors: **Carolyn Vallas
Patricia Taylor
Wraegen Williams**

| | | | | | |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | All STEM | Year 4 | Type 1A | 0653199 | VA |

Poster Title: **The Academic Community for Engineering Students (ACES)**

Keywords: **UG Research/Internship Opportunities, Articulation & Transfer Issues**

Poster Abstract: The Academic Community for Engineering Students (ACES) program is a joint partnership between the University of Virginia, School of Engineering and Applied Science’s (SEAS) Center for Diversity in Engineering (CDE) and Thomas Nelson Community College’s Division (TNCC) of Mathematics, Engineering, and Technology (MET). Together, the CDE and TNCC have set out to increase the number of students that seek and pursue engineering degrees, SEAS year-one-to-year-two retention rate, TNCC’s transfer rate, SEAS 5-year graduation rate, and TNCC’s three-year graduation rate. ACES overarching goal is to increase the number of students – especially those from underrepresented populations – that earn engineering baccalaureate degrees through the use of proven and innovative recruitment and retention activities.

Through this partnership, UVA and TNCC have monitored the number of incoming engineering students and aided them in continuing their pursuit of an engineering degree since the start of this grant in 2007. Each year following the inception of this grant, both institutions have noted an increase in the number of students pursuing engineering degrees. Beyond these enrollment values, over the past year, TNCC and the CDE worked together to overcome some of the challenges faced by two-year/four-year partnerships. By overcoming these challenges this partnership has continued to: 1) enhance introductory engineering courses, 2) increase the number of students that are retained within the engineering major, and 3) increase the number of students that benefit from hands-on research experiences under the guidance of faculty members, postdoctoral researchers, and graduate students at UVA. Since 2007, more than 50 students have graduated from TNCC with an associate’s degree in engineering and more than 1,800 students have graduated from UVA with a baccalaureate degree in engineering. Based on these values, the ACES partnership between UVA and TNCC is impacting the number of students that pursue and achieve engineering baccalaureate degrees.

Poster #: 5 - 01 Session: A Lead Institution: **University of Virginia – Type 2**

Authors: **David Feldon**
Kirk Stowe
Jie Chao
Denise Strickland
Melissa Hurst

| | | | | | |
|-------------|-----------------------|---------------|---------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Type 2 Project | Year 4 | Type 2 | 0965185 | VA |

Poster Title: **The Effects of Cognitive Task Analysis-based Instruction on Students' Achievements and Retention in Undergraduate Biology Courses**

Keywords: **Supplemental Instruction, Introductory Changes, Research Projects/Type 2**

Poster Abstract: Poor instruction has been cited as a primary cause of attrition from Science, Technology, Engineering and Mathematics (STEM) majors and a major obstacle to learning for those who stay (Seymour and Hewitt, 1997). This research project aims to improve undergraduate retention and achievement in the biological sciences through the reformulation of instruction in the core course sequences. The core technique employed in the instructional design process is Cognitive Task Analysis (CTA), which is an effective tool for eliciting, analyzing, and representing expert knowledge in a more accurate and complete manner. A double-blind experimental design was employed to test the effectiveness of CTA-based instruction in comparison with the traditional instruction. Supplemental instructional videos were delivered to students in a laboratory-based undergraduate biology course (n = 1,979) at a public, Tier-I university in the Southeast for six semesters from 2008 to 2010. The video-based lectures were delivered by an award-winning biology instructor using a script of his own writing in the control (traditional) condition and a script derived from cognitive task analyses conducted with expert biologists in the treatment (CTA-based) condition. Access to the different versions of the video was provided by lab section using random assignment. Treatment and control groups did not differ significantly on pre-treatment measures of either motivation or scientific reasoning ability. Dependent measures used to measure the impact of the treatment on student outcomes were students' course attrition, performance on lab reports scored with a previously validated rubric (inter-rater reliability > 0.8), and post-course surveys of motivation related to course topics and biology as a major.

Overall, CTA-based instruction appeared to be more beneficial than the traditional instruction for the students, especially those low-achieving students. Results from the first semester (Spring 2008) showed that students (N=314) receiving traditional instruction were almost six times more likely to withdraw from the course than students receiving CTA-based instruction (8.1% vs. 1.4% of initial enrollment). Of the students who completed the course, those who received the CTA-based instruction demonstrated significantly higher levels of performance in the discussion section of their written laboratory reports (effect sizes of 0.232 > Cohen's d > 0.391). Significantly higher performances were seen specifically in the areas of analyzing data to formulate valid conclusions, considering alternative explanations, consideration for the limitations of the experimental design and implications of the research (Feldon et al, 2010). With the same dataset (Spring 2008), also explored were the effects of four micro design factors of the instructions. The instructional videos were transcribed and analyzed in terms of frequency of omission, content specificity, and knowledge representation formats (procedural or conceptual). Compared with the traditional instructions, the CTA-based instructions had fewer omissions, greater specificity, and more instances of procedural instruction. Despite differences in both the content and the knowledge representation formats used within the instructional conditions, only the level of content specificity significantly correlated positively with students' achievement. This finding points to the importance of CTA as a step in the instructional design process more influential than the representation format of instructional content (Feldon & Stowe, 2009). Current and ongoing analyses of the remainder of data indicate that CTA-based instruction is differentially effective for struggling students and has greatest and most reliable effects on students who were repeating the course.

Poster #: 5-02 Session: B Lead Institution: **University of Illinois at Urbana-Champaign -- Type 2**

Authors: **William Trent** **Blanca Rincon**
 Lorenzo Baber **Montrisha Williams**
 Casey George-Jackson **Chanee Anderson**
 Gregory Kienzl **Diane Fuselier-Thompson**
 Shywon Berry **Mariana Garcia Martinez**

| | | | | | |
|-------------|-----------------------|---------------|---------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Type 2 Project | Year 2 | Type 2 | 0856309 | IL |

Poster Title: **Underrepresented Undergraduates in STEM at Large Research Universities: From Matriculation to Degree Completion**

Keywords: **Research Projects/Type 2, Underrepresented Students**

Poster Abstract: This three-year study examines the matriculation, persistence, and degree attainment of full-time, first-time women, students of color, and low-income undergraduate students in the STEM fields at a consortium of large, public, research universities, which are significant producers of STEM degrees. Quantitative and qualitative methods are used to examine individual and institutional factors and programs that impact the (under)representation of students in a wide variety of math- and science-based fields. The project, currently in its second year, has three distinct components.

The first component examines existing longitudinal data from the Andrew W. Mellon Foundation on students who began college in 1999 at eight, large research universities. In 2005-2006, these institutions granted 9 percent of all baccalaureate STEM degrees awarded by public four-year institutions nationwide, including 7 percent of all Bachelor's degrees earned by women in the STEM fields, and between 3 and 4 percent of Bachelor's degrees in the STEM fields earned by Blacks and Hispanics. Semester- and academic year-based information on their major, credits attempted/earned, grade point average, and financial aid received all help paint a comprehensive portrait of their undergraduate experience. This project expands that portrait by examining students' entrance into and persistence in high-profile STEM majors, such as engineering, as well as the agricultural sciences, health sciences, and psychology. In addition to observing students who "swirl" between various STEM majors during their undergraduate education, we identified significant factors that impact students' likelihood of entrance and success in the STEM fields.

The second component of the project gathers qualitative data from administrators and directors of STEM intervention programs (SIPs) at ten large, public, research universities. Interviews with the program staff of recruitment and retention programs were conducted in 2010. A sample of the guiding research questions for this component of Project STEP-UP include what theories or perspectives guide the design of SIPs, how SIPs are structured and funded, as well as the common challenges SIPs face. Examples of SIPs that were examined within this study include academic bridge programs, high school-to-college transition programs, research opportunity programs, and programs that offer tutoring, mentoring, advising, financial support, and social networking opportunities. Preliminary results identify several common trends among recruitment and retention programs on project campuses in STEM areas, including: program designs based on anecdotal evidence rather than research-based logic models; a lack of resources to perform evaluations and assessments of program; and a quest for legitimacy within the SIPs respective college/departments. Programs seek legitimacy in multiple ways from contesting for recurring and adequate funding, through the hiring of sufficient and qualified personnel, and strengthening their role(s) in their college and on campus.

The final component of the project consists of online survey data of current undergraduate students at nine universities collected in the summer and fall of 2010. The survey investigates students' experiences in the STEM fields, including pre-undergraduate and undergraduate factors that impacted their decision to enter the STEM fields. The analysis of this data thus far has primarily focused on issues pertaining to department climate, science identity, and students' self-efficacy.

Starting Fall 2011, we will collect additional data in the form of follow-up interviews with SIP directors and online surveys with undergraduate students. These new data collection efforts will provide longitudinal observations, including funding sources of SIPs and whether or not students persist in STEM majors. In addition, a graduate-level course on factors that impact students' participation and success in STEM and issues surrounding underrepresentation in STEM will be offered online in Spring 2012. Students from the thirteen universities which form the Committee on Institutional Cooperation, including Michigan State University and the University of Chicago, will be able to take the course. The course will draw upon existing literature and research, as well as incorporate findings and implications from this project.

Poster #: 5 - 03 Session: C Lead Institution: **University of California – Los Angeles**

Authors: **Sylvia Hurtado**
Kevin Eagan
Josephine Gasiewski
Gina Garcia
Felisha Herrera

| | | | | | |
|-------------|-----------------------|---------------|---------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Type 2 Project | Year 3 | Type 2 | 0757076 | CA |

Poster Title: **Improving First- and Second-Year Experiences of Engineering and Technology Majors**

Keywords: **UG Research/Internship Opportunities, Introductory Courses, Research Projects/Type 2, Underrepresented Students**

Poster Abstract: Our project aims to identify the factors that inhibit or enhance underrepresented racial minority (URM) students' pathways toward research careers in science, technology, engineering, and mathematics (STEM) fields. For the last six and a half years, we have followed students who entered college as first-time students in the fall of 2004 with three national surveys: the 2004 Cooperative Institutional Research Program (CIRP) Freshman Survey, the 2005 Your First College Year survey, and the 2008 College Senior Survey. Our longitudinal freshman-senior sample includes 6,373 students from 240 institutions, and over the last two years we have merged registrar's data and students' transcript data from the National Student Clearinghouse to provide a more complete picture of STEM degree completion and retention. The quantitative dataset includes matched samples of URM STEM, URM non-STEM, and White and Asian American STEM majors. We have used a variety of multivariate statistical analyses to determine predictors of changes in students' aspirations for advanced degrees, institutions' efficiency at generating undergraduate degrees in STEM, STEM retention and degree completion, and student-faculty interaction, among others. In addition to this large amount of quantitative data, we also have collected a substantial amount of qualitative data. In the winter and spring of 2010, we conducted focus groups with STEM graduate students to explore their decision to attend graduate or professional school, their experiences in their graduate or professional program, and their plans for the future. We had approximately 150 participants across seven institutions. Themes of note include students' lack of exposure to multiple career pathways and the ways in which they navigate career trajectories, as well as the intersection of students' identities as scientists with their gender, SES, racial, religious and sexual identities. In the spring of 2011, we are launching a post-baccalaureate survey, which will be administered to our original sample of students from 2004. This survey is an all-encompassing, with modules for graduate and professional school students and working professionals. The most challenging aspect for our project has been keeping students in the quantitative portion of the study engaged with the project, as indicated by our low longitudinal response rates. We have made our incentive structure more appealing and have developed a branding strategy to keep our project participants updated on our progress.

Authors: **Jorja Kimball
Margaret Hobson
Judy Kelley**

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|---------------------------------|---------------------|---------------|------------------------|----------------|-----------|
| Multi-school Partnership | All STEM | Year 1 | Special Project | 1001621 | TX |

Poster Title: **Networking STEP Project Leadership for Sharing Best Practices**

Keywords: **Learning Communities**

Poster Abstract: Networking STEP Project Leadership for Sharing Best Practices (NSBP) has conducted two of three planned workshops. With a goal of creating a community of scholars and listing promising practices for STEM recruitment and retention in Texas, NSBP initially targeted 13 funded NSF STEP Type 1 projects in Texas for participation. One project ended after proposal submission and declined participation (University of Houston-Downtown). By Workshop II, two additional NSF projects had been funded and invited to participate. The 12 projects originally targeted (1-12) and the 2 newly funded Texas STEP projects (13 & 14) include:

1. Angelo State University
2. Eastfield College – Dallas
3. Lamar University – Beaumont
4. University of Houston
5. Tarleton State University
6. Texas A&M University
7. Texas A&M University – Corpus Christi
8. Texas A&M University – Kingsville
9. West Texas A&M University
10. University of Texas At Arlington
11. University of Texas at Dallas
12. University of Texas at El Paso
13. Letourneau University (Longview)
14. St. Edward’s University (Austin)

Workshop I, held in Dallas May 2010, facilitated networking among the STEP leadership. It also provided information to newer projects from the more experienced STEP leaders, and conducted an interactive exercise on the importance of data collection and its use measuring progress toward a project goal. Workshop I had 24 attendees including NSBP personnel and representatives from 11 projects, as one (Eastfield College) was not able to attend.

A survey on STEP Strategies was sent in June 2010 to each participating project. Two newly funded Texas STEPs (St. Edwards University and Letourneau University) were also surveyed in August, bringing survey participation to 13 of 14 Texas STEP projects for a response rate of 93%. Specific strategies were compiled under two general effort headings with results of:

- Recruitment
 - o 5 projects report one or more high school activities
 - o 4 projects report community college efforts
 - o 2 projects report efforts recruiting undeclared students
- Retention
 - o All respondents indicated having major retention efforts
 - o 10 focus on first year continuing to second year
 - o 7 focus on second year continuing to third year
 - o 5 focus on transfer students continuing to the next year

Workshop II was held in Houston October 2010 with 29 attendees including representatives from all 14 Texas STEP projects, NSBP personnel, and Dr. Daniel Udovic (University of Oregon), organizer for the spring 2011 annual NSF STEP PI meeting. This workshop focused on data collection, analysis, and dissemination with publication a primary component. Both quantitative and qualitative data were emphasized, and differentiations between evaluation and research design were discussed. Propensity scores were explored as a mechanism for use when random sampling could not occur. Survey results indicated the information on research design, and particularly propensity scores were helpful, with several promising practices listed: Need to include both quantitative and qualitative methods; Use propensity scores where large random samples are not feasible; Use a broad base of students to increase sample size. Workshop III will be held on May 18-19, 2011.

Poster #: 6 - 01 Session: A Lead Institution: **Armstrong Atlantic State University**

Authors: **Traci Ness**
Sabrina Heissinger
Delana Nivens

| | | | | | |
|------------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Bachelors | All STEM | Year 2 | Type 1A | 0856593 | GA |

Poster Title: **Bridging the Gap: Using research and Learning Communities to Increase STEM Majors at AASU: Progress, Years 1 and 2**

Keywords: **Recruitment, Peer Mentoring, Math Preparation, UG Research/Internship Opportunities, Learning Communities, Student Tracking, Underrepresented Students, Institutional Change**

Poster Abstract: Armstrong Atlantic State University is a regional, open-access, primarily undergraduate institution of ~7600 students from across Georgia, but primarily from the 4-county region surrounding Savannah. In 2009, the College of Science and Technology (CST) received a STEP grant with the goals to increase STEM majors (especially low-income, minority, and rural students) and to improve CST's freshman retention rate and six-year graduation rate of declared freshman STEM majors. Our project combines freshman living and learning communities, a summer mathematics program, peer mentoring, and paid undergraduate research before and after the first year at Armstrong. In addition, the project is designed to initiate a culture shift among students and faculty that puts greater emphasis on undergraduate research.

Our first class of STEP students consisted of 9 women and 6 men with average SAT scores of 572 (Math) and 551 (Verbal). The second class, 7 women and 10 men, was more diverse and had average SAT scores of 606 (Math) and 577 (Verbal). First-year student retention in STEP was only 66%, while it rose to 94% the second year and all students accepted to STEP thus far have remained STEM majors. We have also seen improvements in first-semester GPAs (2.82 vs. 3.2), first math course GPAs (2.79 vs. 2.94), and more advanced math courses in the first semester (43% Algebra, 21% Pre-Calc, 28% Calc I and II vs. 24% Algebra, 41% Pre-Calc, 36% Calc I and II). Undergraduate research has become a focal point within our college and the culture of the students and faculty has begun to change. Faculty participation in STEP has continued to grow and the number of grant submissions to the NSF and NIH has significantly increased. While Armstrong's enrollment has gone up 4.6% in the last year, some of the departments within our college have had significantly higher increases in the number of their majors (22% for Chemistry and Psychology, 23% for Engineering, and 82% for Physics). Even though we are only in our second year, it is clear that the STEP program is having a significant impact on the College of Science and Technology at Armstrong.

Poster #: 6 - 02

Session: B

Lead Institution: **Alma College**

Authors: **John Davis**
Myles McNally
David Clark

| | | | | | |
|------------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Bachelors | All STEM | Year 2 | Type 1A | 0856613 | MI |

Poster Title: **Merit-Based Immersion Project for Students and Teachers**

Keywords: **Recruitment, Peer Mentoring, UG Research/Internship Opportunities, Learning Communities, Program Evaluation**

Poster Abstract: The Alma College PRISM project (Positive Routes Into Science and Mathematics) is a program that focuses on increasing the number of STEM graduates through a positive recruitment and retention program that creates a STEM learning community. It engages students through a focus on early involvement with undergraduate research and an enhanced introductory STEM curriculum.

The core of the PRISM plan is a comprehensive suite of activities spanning the STEM student’s first year at Alma College. It begins with a summer research oriented experience before the student arrives on campus, moves through a series of courses, seminars, and community building activities, and culminates with a summer research experience. Select students move on to become student research associates and peer mentors in their later years. STEM students are recruited to Alma through outreach to area high schools and recruitment at science fairs, Alma’s Math, Science and Technology Day, and Alma’s Scholars Summit Day.

Important Core Activities 2010-2011

ASPIRE: Twenty-three entering students Alma College spent one week on Alma’s campus working in small research teams of faculty, upper-class, and first-year researchers. An exit survey shows the program was well received, with 86% of students rating it excellent and the remaining 14% very good. More importantly, students overwhelmingly reported that the experience significantly increased their confidence in their research skills and also in their ability to succeed in graduate school and in their chosen career. This summer we will support up to thirty students and expand the program by one day.

FIRST-YEAR SEMINARS: Seven seminars were offered through the program, with topics ranging from Flavor and Fragrance Chemistry to Biotechnology Industries. These seminars benefited by shared planning among the instructors and some shared experiences by the students. While exit surveys show the courses to be well received, they varied by course on how well they generated additional interest in science and science careers. Since non-science majors can also take these courses, we are investigating which courses had the greatest science student enrollments and impacts.

FIRST-YEAR SUMMER RESEARCH PROGRAM: Eleven first-year students participated in last summer’s program, where they worked with faculty and upper-class peer mentors on ongoing research projects for ten weeks. An exit survey shows the program was well received, with 38% of students rating it excellent and the remaining 62% very good. Demand for the program was so great that the program has been reconfigured so that this summer we will support sixteen students. To do this we reduced the stipend but the College agreed to provide the students with free housing and four academic credits.

EVALUATION: With the support of our institutional research office, a number of survey instruments have been created, as referenced above. In addition, a survey was given to all entering students to gauge interest in science majors. Fifty-five% indicated such an interest, compared to 52% the year before. We will use this information to track these students during their career at Alma College.

A number of other activities have occurred as well, including recruitment, speakers, curriculum development, and meetings with internal and external advisory committees. In addition we will present PRISM program findings at the Association of American Colleges and Universities conference Engaged STEM Learning: From Promising to Pervasive Practices this March.

Poster #: 6 - 03 Session: C

Lead Institution: **Cabrillo College**

Authors: **Susan Tappero**
Karen Groppi

| | | | | | |
|-----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Two Year | All STEM | Year 3 | Type 1A | 0757114 | CA |

Poster Title: **STEEP-Science, Technology and Energy: Expanding Potential**

Keywords: **Recruitment, Math Preparation, UG Research/Internship Opportunities, Learning Learning Communities, Service Learning**

Poster Abstract: This project is attracting and retaining students to science, technology, engineering and mathematics (STEM) fields via involvement with sustainable technologies in two ways. The project includes a Summer Energy Academy as a preparation for a later Energy internship, placement in undergraduate research and/or industry internships. Another effort aimed at increasing retention within STEM majors is PREP; the Precalculus-Preparedness Seminars. Students already interested in a STEM field who are at-risk for success in math curriculum participate in this program. Counseling, mentoring and tutoring support are provided through an existing Math, Engineering, Science Achievement (MESA) center, where all participants can join the ongoing learning community there. A capstone activity of the Energy Laboratory academy is a community service project involving renewable energy. Learning through teaching is an important component of the PREP activity.

The project's intellectual merit stems from the interplay of the many interventions being employed: project-based learning, service learning, learning through teaching, intensive cohort experiences, individualized learning, and longitudinal support through established learning communities. It addresses the need for improved performance in two gateway classes: Precalculus—the course necessary for almost all lower division college technical coursework, and Circuits, a prerequisite for almost all upper division college technical coursework in many engineering disciplines. It builds on past successes of the MESA center.

The project's broader impacts are twofold: results from the comprehensive evaluation of the project are being widely disseminated to encourage others to try similar efforts; and the students graduating from the project are helping to meet the workforce needs in the greater Silicon Valley and Monterey Bay area.

Poster #: 6 - 04

Session: A

Lead Institution: Lamar University

Authors: **Jennifer Daniel**
Peggy Doerschuk
Judith Mann
Cristian Bahrim
Joseph Kruger
Christopher Martin

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Masters | All Stem | Year 3 | Type 1A | 0757057 | TX |

Poster Title: **STAIRSTEP: Students Advancing through Involvement in Research Student Talent Expansion Program at Lamar University**

Keywords: **Recruitment, Peer Tutoring, Peer Mentoring, UG Research/Internship Opportunities, Articulation & Transfer Issues, Career Counseling, Program Evaluation, Underrepresented Students**

Poster Abstract: The Students Advancing through Involvement in Research Student Talent Expansion Program (STAIRSTEP) at Lamar University is designed to increase the number of students receiving baccalaureate degrees in science. This project consists of teams of 4-6 students directed by a faculty member in each of five disciplines: Computer Science (CS), Chemistry (CH), Earth and Space Science (ESS), Mathematics (MA), and Physics (PH). Each team works on a research project and participates in local recruiting events to increase interest in STAIRSTEP and Science, Technology, Engineering, and Mathematics (STEM) in general. This program targets “at-risk” students, including women, minorities, first-generation, and low-income. STAIRSTEP seeks to increase the number of graduates in the short term by retaining these “at-risk” students in the STEM disciplines. STAIRSTEP seeks to increase the number of graduates in the long term by sharing information and passion for STEM with local high school, community college, and undecided Lamar students and with the community as a whole.

The STAIRSTEP Program has three major goals: (1) retain and develop at risk students in CS, CH, ESS, MA, and PH through an enriched research experience that includes mentoring, tutoring, and other support, and activities that are designed to dispel some of the misconceptions that make these fields unattractive; (2) help transition these students to graduate study or careers in science; and (3) attract more students to the fields through targeted recruiting functions. Project findings reflect the documentation of movement toward these goals.

Forty-seven undergraduate students have participated in the STAIRSTEP program since it began in January of 2009. Forty-five of the 47 (95.74%) have been retained as CH, CS, ESS, MA, and PH majors. STAIRSTEP students have consistently had significantly higher grades and lower drop rates from courses in their majors than cohort comparisons from recent years. Fourteen STAIRSTEP students presented their research at professional meetings and conferences in 2010. Four others attended and participated in these meetings. All STAIRSTEP students participate in Career Center events, Research Seminars, Career Forums, and student professional societies for their discipline.

It was expected that 80% of STAIRSTEP students would transition into advanced studies or careers in STEM within six months of graduation. Of the 10 participants who graduated six months ago or more, 6 have started graduate studies and 4 have started careers in STEM. Two of the graduates are both employed in a STEM career and taking graduate course work.

Since its inception, STAIRSTEP students and faculty have reached out to over a thousand students, teachers, and community leaders through a wide variety of recruitment activities, including hosting on-campus tours, workshops and demonstrations in STEM. Participants have taken part in on-campus events like Open House and New Student Orientation, and off-campus events like road shows and career days at local high schools and community colleges.

Poster #: 6 – 05 Session: B Lead Institution: **University of Southern Indiana**

Authors: **Scott Gordon**
Shelly Blunt
Linda Tribble

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 3 | Type 1A | 0756978 | IN |

Poster Title: **Southwestern Indiana STEM (SwISTEM) Initiative**

Keywords: **Math Preparation, UG Research/Internship Opportunities, Faculty & Staff Development**

Poster Abstract: The Southwestern Indiana STEM (SwISTEM) Initiative at the University of Southern Indiana consists of four individual component programs. The four components include: 1) development and implementation of the SwISTEM Early Undergraduate Research Program; 2) formation of the Pathways Leading to Undergraduate Success in the Sciences (PLUSS) Program; 3) increased community and K-12 involvement through the SwISTEM Outreach Program; and 4) improved pedagogical approaches through the SwISTEM Professional Development program for K-16 teachers. The Early Undergraduate Research Program engages undergraduate STEM majors in exciting and innovative scientific research early in their college careers. The Pathways Leading to Undergraduate Success in the Sciences (PLUSS) Program is a first-year transition program for under-prepared and at-risk students who intend on majoring in a STEM discipline. These four components of the SwISTEM Initiative aim to address the intellectual growth and development of southwestern Indiana's next generation of scientists, engineers, and mathematicians. With such growth, we strive to assist in bringing the region and state into the forefront of high paying, highly intellectual, science and technology based jobs. The activities also serve to educate community leaders and the general public about the importance of a STEM literate workforce. The establishment of public/private partnerships fosters educational and career development throughout southwestern Indiana. The SwISTEM Initiative places southwestern Indiana into a leadership role in STEM education, including the recruitment, promotion, and training of students, STEM teachers, and citizens in the STEM areas. Our background, mission, and resources in the STEM areas make USI a perfect fit for the implementation of the SwISTEM Initiative.

Authors: **Rahman Tashakkori**
Nicole Bennett
Jennifer Burris
Barry Kurtz
Trina Palmer
Anthony Calamai

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 3 | Type 1A | 0756928 | TX |

Poster Title: **Appalachian Undergraduate Academy of Science**

Keywords: **Recruitment, Math Preparation, Peer Tutoring, Peer Mentoring, Supplemental Instruction, Learning Communities, Introductory Courses, Underrepresented Students**

Poster Abstract: Appalachian State University received this STEP Phase I grant to establish the Appalachian Undergraduate Academy of Science. The program intends to attract and retain freshmen, sophomores, and first year transfer students in the STEM majors by:

- establishing clusters to involve undergraduate students and local high school interns in research
- providing start-up funds to research clusters
- providing scholarship funding to all participating scholars
- establishing a summer bridge program for students needing Calculus preparation
- establishing a residential learning community
- providing advising, tutoring, and supervised study halls
- encouraging scholars to enroll in a core common curriculum
- including upper-division students as peer-mentors

The program is in its third year. Our early results are:

- Fall 08 (10 research clusters - 36 students, 3 high school interns, 14 faculty)
- Spring 09 (12 research clusters - 40 students, 4 high school interns, 16 faculty)
- Fall 09 (17 research clusters – 63 students, 7 high school interns, 20 faculty)
- Spring 09 (17 research clusters – 63 students, 8 high school interns, 20 faculty)
- Fall 10 (15 research clusters – 58 students, 6 high school interns, 16 faculty)
- Study groups in all fundamental courses across disciplines of science and math
- 12 upper-level peer-mentors as Study Hall Leaders
- Academy of Science Conference Day, Fall 08, Fall 09, and Fall 10
- Core common curriculum was enforced starting Fall 09
- Residential Learning Community was established in Fall 09 with 26 students

Summer Bridge Program:

- Summer 2009 with 20 participants (5 Chemistry, 6 Computer Science, 7 Biology, 1 Math, 1 Physics). Fifteen out of twenty participants were certified to take Calculus 1 in Fall 09.
- Summer 2010 with 19 participants (7 Chemistry, 5 Computer Science, 2 geology, 2 Math, and 3 Physics). All participants were certified to take Calculus 1 in Fall 10.

Challenges we have faced:

- The \$350/semester funding seems inadequate to generate sustained interest
- Scheduling research clusters at a time that works for all team members
- Difficulty in recruiting and planning for the summer bridge program with the uncertainty in number of applicants
- Significant administrative responsibilities

To address these challenges:

- Increased the funding to \$500 for scholars in the second year
- Obtained approval for Priority Registration of our scholars
- Advised students to take common courses and planning in advance
- Established early communication with the next year’s candidates
- Added graduate students and administrative assistants

Poster #: 6 - 07 Session: A Lead Institution: **CUNY Queensborough
Community College**

Authors: **Paris Svoronos
Melvin Gorelick
Thomas Streckas**

| | | | | | |
|-----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Two Year | All STEM | Year 4 | Type 1A | 0652963 | NY |

Poster Title:

Keywords: **Peer Tutoring, Peer Mentoring, UG Research/Internship Opportunities, Career Counseling, Introductory Courses, Faculty & Staff Development, Program Evaluation, Student Tracking, Underrepresented Students, Institutional Change**

Poster Abstract: The Queensborough Bridge Grant involves both the Biology and Chemistry departments of a community college (Queensborough Community College-CUNY) and a senior college (Queens College-CUNY) as well as a major research institution (Brookhaven Laboratory). The project aims at increasing the number of STEM students via a seamless academic transition upon graduation from the junior and transfer to the senior college. Undergraduate participation of freshmen in research projects have led to professional (ACS and MACUB) conference presentations and publications of research findings to peer-reviewed journals. Other activities include attending and summarizing talks of seminar speakers and group tutoring that have created a “learning community cohort” among STEM students. Participation in summer and winter programs at the Brookhaven Laboratories as well as other internships with the Food and Drug Administration (FDA) and the Division of Environmental protection (DEP) of New York City enhance the academic grooming of students. The number of students involved has increased dramatically since the inception of the grant.

Poster #: 6 - 08 Session: B

Lead Institution: **San Diego State University**

Authors: **Raga Bakhiet**
Rafael Alvarez
Angeline Yang

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|---------------------------------|---------------------|---------------|----------------|----------------|-----------|
| Multi-school Partnership | All STEM | Year 4 | Type 1A | 0653277 | CA |

Poster Title: **STEP Partnership of San Diego (SPSD)**

Keywords: **UG Research/Internship Opportunities, Supplemental Instruction, Articulation & Transfer Issues, Career Counseling, Introductory Courses, Student Tracking, Underrepresented Students**

Poster Abstract: The Mathematics, Engineering, and Science Achievement (MESA) Program assists educationally disadvantaged students to graduate from four-year institutions with a math-based major. MESA focuses on student groups who historically have had low levels of attainment.

The National Science Foundation (NSF)-supported STEP Partnership of San Diego (SPSD) incorporates the successful MESA model at each partner campus (San Diego State University, San Diego City College, and Southwestern College); enhancing essential services (e.g. academic support, STEM competitions, leadership development, UG research/internships, etc.) that help students excel academically and prepare for the STEM workforce. Together, MESA and SPSD create a partnership of educational, industry, and government organizations forming a pipeline from community college to university to STEM industry. The goals of SPSD are to: increase the number of students who pursue STEM academic and career pathways, increase retention in STEM disciplines, and promote opportunities in STEM post-graduate studies.

Authors: **Claire Duggan**

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|---------------------------------|---------------------|---------------|----------------|----------------|-----------|
| Multi-school Partnership | Engineering | Year 4 | Type 1A | 0653090 | MA |

Poster Title: **Northeastern University’s Science, Technology, Engineering and Mathematics Talent Expansion Program – University Partnership (NU STEP-UP) aims to increase the number of students receiving degrees in STEM disciplines.**

Keywords: **UG Research/Internship Opportunities, Supplemental Instruction, Faculty & Staff Development**

Poster Abstract: DUE – 0653090 (NSF). PI: Christos Zahopoulos. Co-PIs: Tom Cullinane, Claire Duggan (Project Director), Yiannis Levendis, Mohamad “Hameed” Metghalchi. Northeastern University, MassBay Community College, Middlesex Community College, Northern Essex Community College. NU STEP-UP

Northeastern University’s Science, Technology, Engineering and Mathematics Talent Expansion Program – University Partnership (NU STEP-UP) aims to increase the number of students receiving degrees in STEM disciplines.

STEP-UP is a collaboration between Northeastern University’s Science, Engineering and Mathematics departments, two NSF-supported Research Centers (Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems and The Center for High Rate Nanomanufacturing) and three Boston area Community Colleges: MassBay Community College, Middlesex Community College and Northern Essex Community College). Using research as the catalyst for engagement, STEP-UP will:

1. Create a sustainable STEM partnership between NU’s Science, Engineering and Mathematics departments and local Community Colleges by leveraging its two NSF-supported research centers.
2. Create a Partner Faculty Network (PFN), with representatives from all stakeholders, who will:
 - a) Participate in working seminars;
 - b) Share innovative STEM instructional models and practice;
 - c) Collaborate to bring STEM courses at Community Colleges in alignment with comparable courses at four-year institutions and develop common assessment tools to be utilized by faculty teaching STEM courses at NU and partner Community Colleges.
3. Provide CC faculty the opportunity to immerse themselves in the research environment of the partnering Centers through seminars, cross institutional visits, and participation in the Research Experiences for Teachers (RET) initiative.
4. Provide CC students access to research laboratories through expansion of summer research experiences (REU program), cross-institutional visits throughout the academic year, and participation in two Co-op experiences upon transfer to NU.
5. Develop a Transfer Bridge Program for CC students transitioning to Northeastern University, using as a model the successful Northeastern University Summer Bridge Program for entering freshman. In addition CC partners will be encouraged and supported to replicate the Summer Bridge Program.
6. Provide academic mentoring and research activities for all STEM students and share best practices with local partner institutions.

Poster #: 6 – 10 Session: A Lead Institution: **CUNY College of Staten Island**

Authors: **William Fritz**
Carlo Lancellotti
Nelly Tournaki

| | | | | | |
|------------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Bachelors | All STEM | Year 4 | Type 1A | 0653056 | NY |

Poster Title: **Full STEAM**

Keywords: **UG Research/Internship Opportunities, Learning Communities**

Poster Abstract: At the beginning of its fourth year the STEAM program at the College of Staten Island finally reached operational maturity. This poster describes the complete "STEAM pipeline" that is now fully in place: early detection of potential STEM majors, STEM-focused orientation and advisement, first-year learning communities and curricular enhancements, first and second year scholarship support, third and fourth year undergraduate research programs. We will present data that show how STEAM has contributed to an ongoing significant growth in both STEM majors and graduates at the College. Other data show that STEAM-supported students achieve substantially higher GPA's than a control group. Retention and graduation data are still sketchy. Whereas during its initial years STEAM does not appear to have had much effect on 1-year retention numbers, there are early indications of a positive contribution retention over a 2-year time-frame, which augurs well for long-term retention and graduation outcomes.

Poster #: 6 – 11

Session: B

Lead Institution: **DePaul University**

Authors: **Chris Goedde**
Lynn Narasimhan
Yevgeniya Lapik
James Onoda
Stacy Wenzel

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | Science | Year 4 | Type 1A | 0653198 | IL |

Poster Title: **Building a STEM Pipeline in Chicago**

Keywords: **UG Research/Internship Opportunities, Articulation & Transfer Issues**

Poster Abstract: This project is a partnership between DePaul University and two of the City Colleges of Chicago, Harold Washington College and Harry S Truman College. The goals of the project are to build a supportive environment for the education of STEM majors, to expose STEM students to research opportunities early in their studies, to provide opportunities for research positions and internships at Chicago-area science museums, corporations, and institutes, and to coordinate the curriculum at the three academic institutions to aid student matriculation. To achieve these goals we have (1) designed and implemented an "Introduction to Research" summer program for selected first and second year DePaul and community college students. (2) Developed formal partnerships with local science museums and other organizations to place students in external research assistantships and educational internships. (3) Worked to build academic-year student support and community-building programs. (4) Begun formalizing articulation and dual-admission agreements between DePaul University and several Chicagoland two-year colleges. Initial evaluation results for the first three years of the project will be presented.

Poster #: 6 - 12 Session: C Lead Institution: **University of South Carolina - Columbia**

Authors: **Timothy Mousseau
Michael Schillaci
Susan Hudson
Jason Katz
Abraham Wandersman
Pearl Fernandez**

| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
|------------------|---------------------|---------------|----------------|----------------|-----------|
| Bachelors | All STEM | Year 4 | Type 1A | 0653164 | SC |

Poster Title: **SC STEPs to STEM: Using Evaluation to Improve Transfer Student Outcomes**

Keywords: **Program Evaluation, Underrepresented Students**

Poster Abstract: The primary goals of the STEPs to STEM project at the University of South Carolina are to increase the enrollment, retention, and graduation of transfer students in science, technology, engineering, and mathematics (STEM) majors. Our poster will describe 1) the program's progress to date, with a special focus on process evaluation and short-term outcome evaluation data, and 2) the program's evaluation methodology and processes by which data are used for decision-making and improvement.

The evaluation of STEPs to STEM includes the use of process evaluation and short-term outcome evaluation methods. Two short-term outcome evaluation indicators are used as part of the program's short-term outcome evaluation: 1) student performance in STEM coursework, and 2) student sense of community. Student performance in STEM coursework was selected as a short-term outcome because it is expected to predict longer-term retention and graduation outcomes, a finding that has been shown for transfer students (Ishitani, 2008). Student sense of community was selected as a short-term outcome in light of research on college students' sense of community as a predictor of improved retention and graduation (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005; Tinto, 1993), which may be particularly salient for transfer students who are acclimating to a large university (Townsend & Wilson, 2006).

The process evaluation of STEPs to STEM focuses on the quality of implementation of recruitment (e.g., dissemination of a recruitment packet), admissions (e.g., formulation of the program's eligibility requirements and the selection of students), and program activities (e.g., provision of mentored research experience). Process evaluation is embedded within the FORmatIve Evaluation Consultation And Systems Technique (FORECAST), which is an approach to formative evaluation that offers specific models and tools for program improvement (Goodman & Wandersman, 1994).

In our poster, we will link the program's process evaluation data with its short-term outcome evaluation data, both to describe how STEPs to STEM is making progress towards its primary goals, as well as to illustrate an integrated and logical approach to evaluation that may be useful for other programs. We will include case example illustrations of how the use of FORECAST and the integration of process and outcome evaluation methods have facilitated decision-making and action to improve the program.

Poster #: 6 - 13 Session: A

Lead Institution: **Kapi'olani Community College**

Authors: **Louise Pagotto
Maria Bautista
Amy Patz
Herve Collin**

| | | | | | |
|-----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Two Year | All STEM | Year 4 | Type 1A | 0653292 | HI |

Poster Title: **Strategies and institutionalization practices to improve recruitment and retention of STEM students**

Keywords: **Recruitment, Math Preparation, Peer Mentoring, UG Research/Internship Opportunities, Supplemental Instruction**

Poster Abstract: KCC is in year 4 of a 5-year National Science Foundation STEP grant. The goals of KCC STEP-UP are to:

1. Increase the number of students in the College's STEM pipeline
2. Increase the number of Associate in Science in Natural Science (ASNS) degree completers
3. Increase the number of students matriculating to two collaborating four-year institutions in Hawaii
4. Institutionalize STEP initiatives and to provide ongoing support for STEM students. STEP initiatives include a Summer Bridge program; Undergraduate Research Experience (URE) for STEP students, Peer Mentoring, and Peer-Led-Unit-Study (PLUS) to support STEM gatekeeper courses in life and physical science.

Approximately 160 students have participated in three-week summer bridge workshops focused on enhancing mathematical skills needed for STEM majors. The skills enhancement is achieved through individually paced practice using ALEKS, which data show allows students to improve their math placement levels up to two levels. As a direct result of STEP summer bridge activities, the College has extended this model of math skills enhancement to students in its remedial/developmental program. Based on the results of students' retaking the math placement after STEP summer bridge, the College initiated a change in the statewide policy to allow retesting on demand, without a mandatory wait period. In addition to providing a daily rigorous mathematics session, the program provides each student with opportunities to 1) acquire computer hardware and software knowledge 2) develop Computer-Aided Design (CAD) skills and 3) have hands-on experience with DNA sequencing and Underwater robotics (UROV).

Undergraduate Research Experience (URE) projects are extremely successful and have proven to be a significant "best-practice" activity for both student recruitment and retention. The KapCC STEM URE program provides URE for students in a variety of fields: Physics (lifter), Physiology (pupillometry, actigraphy, and energy balance), engineering (CanSat, UROV, autonomous mapping robotics), Biotech (DNA sequencing), Chemistry and Sustainability (biodiesel), Ecology (hermit crabs), and Botany (indigenous plants). Many of our students are now also presenting their research at national events and undergraduate research conferences.

Peer mentorship and PLUS activities have proven successful for retention. These activities are aimed at STEM gatekeeper courses—courses with high enrollment and low success rates, including physics, biology, chemistry and math. Data confirm that PLUS participants have a high success rate, that there is a direct correlation between the frequency of attendance and grade in the course, and that level of faculty engagement in this activity is an essential ingredient to success.

We have also institutionalized the outreach efforts to the local community by hosting and sponsoring yearly Science Fairs (for middle school students), Physics Olympics (for high school students), STEM fairs, and Undergraduate Research Expos, (inviting local STEM companies at our own College).

Years 4 and 5 are focusing on assessing our recruitment and retention efforts, identifying best practices for our students, and institutionalizing those best practices. Data will be presented to support the efficacy of these efforts.

Poster #: 6 – 14 Session: B Lead Institution: **CUNY Medgar Evers College**

Authors: **Margaret Carroll**
Edward Catapane
Dereck Skeete

| | | | | | |
|------------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Bachelors | Science | Year 5+ | Type 1A | 0622197 | NY |

Poster Title: **STEP into Science at Medgar Evers College, A Successful Strategic Plan**

Keywords: **Recruitment, Peer Tutoring, Peer Mentoring, UG Research/Internship Opportunities, Underrepresented Students**

Poster Abstract: STEP into Science was designed to increase the number of students earning baccalaureate degrees in Biology and Environmental Science. Our program is an interdisciplinary effort between faculty in the Departments of Biology and of Physical, Environmental and Computer Sciences with goals to: (1) aggressively recruit new students and non-STEM students from within the college who select majors in either the Department of Biology or Department of Physical, Environmental and Computer Sciences; (2) improve retention of our science majors by providing additional academic, financial and mentoring support; (3) strengthen both academic departments with curricula that fosters the integration of research, technology and academics to better equip our majors with the skills and knowledge necessary to be successful applicants to graduate/professional programs; and (4) increase the number of students that graduate with baccalaureate degrees in Biology or Environmental Science, and ultimately enter rewarding careers in the science enterprise. Now in our fifth year, the program has had great success implementing the use of peer recruiters to attract more high school, transfer, and non-science college students into STEM majors and places emphasis on the role of undergraduate research experiences as a successful strategy to increase the quality and retention of science majors through their B.S. degree. Since the inception of the program, total STEM enrollment has more than doubled and the number of majors actively engaged in research has risen more than 90% with a concurrent increase in student research presentations at scientific conference, and an 87% increase in the number of students receiving external research internships and travel awards to attend national conferences. STEM graduates have also increased and the program anticipates that these and future STEP into Science graduates will continue on to Masters and Doctoral programs in STEM and ultimately enter rewarding careers in the science enterprise.

Poster #: 6 - 15 Session: C Lead Institution: **University of Central Florida**

Authors: **Michael Georgiopoulos**
Cynthia Young
Melissa Dagley

| | | | | | |
|-------------|---------------------|----------------|-----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Math | Year 5+ | Type 1/a | 0525429 | FL |

Poster Title: **UCF STEP Pathways to STEM: From Promise to Prominence
(The EXCEL Program at UCF)**

Keywords: **Recruitment, Math Preparation, UG Research/Internship Opportunities, Supplemental Instruction, Learning Communities, Introductory Courses, Program Evaluation**

Poster Abstract: EXCEL is an NSF STEP funded grant at the University of Central Florida (UCF), currently in its fifth+ year of operation. EXCEL has as its goal to increase the STEM degrees at UCF. To achieve this goal two objectives have been identified: Objective 1: Recruit 200 students, per year, into the program. Objective 2: To increase the EXCEL STEM retention rate, compared to a control group of students, who are as academically talented as the EXCEL students.

EXCEL has currently (2006-2010) recruited 948 students into its program. Of these 948 students, 649 are male, 299 are female, 91 are African American, and 178 are Hispanic students. EXCEL has seen its applications increase throughout the years, a testament of its increased popularity in the community. In 2009-2010 EXCEL received over 750 applications.

EXCEL has been able to retain its students in STEM at higher rates than the control group of students have been retained at UCF. In particular, considering all the cohorts (06, 07, 08, 09) EXCEL has observed increased retention rates of 18% for its entire student population, 18.5% for its male population, 15% for its female population, 23% for its African American population, and 21% for its Hispanic population, compared to the corresponding control groups of students. EXCEL has offered more than 200 unique research experiences for its students over the 2008-2011 time span.

EXCEL has been institutionalized by UCF, receiving an annual support of \$350k. EXCEL is now one of the units in the Undergraduate Office at UCF, reporting directly to the Dean of Undergraduate Studies. EXCEL has also received funds from Progress Energy and Workforce Central Florida (WCF) to support research experiences for its student cohorts.

Poster #: 6 – 16 Session: A Lead Institution: **Eastfield College**

Authors: **Melanie Gill-Shaw**
Carl Knight

| | | | | | |
|----------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 5+ | Type 1A | 0525536 | TX |

Poster Title: **Eastfield College Project Pathways: Broadening Access and Success of Disadvantaged and/or Underrepresented Groups in STEM Fields**

Keywords: **UG Research/Internship Opportunities, Underrepresented Students**

Poster Abstract: Project Pathways is designed to increase access, student success, and undergraduate research opportunities in STEM fields of study at the community college level, while targeting underrepresented populations. This collaborative effort supports the study of science and generates enthusiasm about research through opportunities for students to conduct investigative projects in both laboratory and field environments. Fifty-seven students have participated in the Summer Research Institutes from 2006-2010. The researchers received stipends of \$3,000 for completion of the summer projects. The persistence rate of this cohort is 95%, as 54 of these students have transferred, graduated, or continued their academic pursuits at Eastfield. Seven of these researchers are currently in graduate programs. Females comprised 49% of participants and 44% were minorities. Twenty-five percent of summer researchers were Hispanic. In addition to undergraduate research opportunities, Project Pathways has also awarded 64 STEM majors scholarships increasing the retention rate of this population. The program has been recognized as Innovation of the Year by our college and selected for presentation at the National League of Innovation Conference as a creative approach to science programming in the community college. Outreach efforts including web site development, STEM lectures, science club creation and student field trips have helped open the world of science to our students while promoting a sense of community on a commuter campus. Partnerships with public schools, universities, non-profit organizations and government entities have strengthened the project and diversity of methodology used. Specialized training for college and public school faculty and students has stimulated interest in scientific research and mentoring activity.

Poster #: 6 - 17 Session: B

Lead Institution: **East Tennessee State University**

Authors: **Jeff Knisley**
Istvan Karsai
Ariel Cintron-Arias
Michele Joyner
Lev Yampolsky
Anant Godbole

| | | | | | |
|-------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | All STEM | Year 5+ | Type 1A | 0525447 | TN |

Poster Title: **Talent Expansion in Quantitative Biology: Lessons Learned and Looking Towards the Future**

Keywords: **UG Research/Internship Opportunities, Program Evaluation**

Poster Abstract: This Type 1 project is in its sixth (no-cost extension) year and we will be submitting a new proposal in September 2011 that capitalizes on our successes, while also branching out in new directions. Our poster will capture this theme in greater detail. Some of the highlights of what we will discuss are as follows: Should the theme continue to be quantitative bio-related science but in a broadened form that includes computer science, chemistry, physics, and other STEM fields? Should we have a research related course each year? How do we reduce attrition? How do we maintain a high level of interest? What is the optimal program size? Should undergraduate research be limited to REU-style summer activity or be longer and more sustained? What successful aspects of our program should we retain? What unsuccessful aspects should we eliminate?

Poster #: 6 - 18 Session: C Lead Institution: **University of New Hampshire-
Main Campus**

Authors: **Barrett Rock
Stephen Hale
Linda Hayden
Barbara Johnson
John Luton
Karen Graham**

| | | | | | |
|-------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | Science | Year 5+ | Type 1A | 0525433 | NH |

Poster Title: **A Model for Recruiting Early Underclassmen into STEM Majors through Partnership among a Historically Black University, a Primarily White University, and Community Colleges**

Keywords: **Recruitment, UG Research/Internship Opportunities, Introductory Courses, Underrepresented Students**

Poster Abstract: Since 2005, the Watershed Watch Project (NSF STEP-#0525433) has developed a partnership dedicated to increasing the number of STEM majors among its partnering institutions. These include the University of New Hampshire (Lead), a Primarily White University; Elizabeth City State University (ECSU), a Historically Black University; and two community colleges, each associated with one of the universities. Of 101 undeclared/undecided early underclassmen, approximately 49% of students declared or were likely to declare a STEM major. The greatest impact among partner institutions was observed at ECSU, where 62% of students will declare or will be likely to declare. UNH and the community college students declared STEM majors at rates ranging from 30%-40%. At UNH, baseline data for undeclared students declaring STEM majors is 20%. The achieved successes have been through the partnership's intentional efforts to enhance a culture and practice of research opportunities beginning with early underclassmen. While the overall numbers of students impacted in the project are modest, the results demonstrate a 2x-3x enhancement in recruitment into STEM majors. The project has moved into its sustainability, institutionalization, and dissemination phases. In these phases, the two universities have institutionalized aspects of Watershed Watch either in discovery coursework for early undergraduates, or as part of larger efforts in community engagement. Watershed Watch was instrumental in ECSU's recent receiving of the Carnegie Foundation's Community Engagement designation. The partnership continues to enhance the research and diversity cultures in each other's campuses through annual participation and exchanges in campus research symposia and other research exchanges for undergraduates and faculty.

Authors: **James Lisy**
Gretchen Adams
Tracey Hickox
Jennifer McNeilly

| | | | | | |
|-------------|---------------------|----------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | All STEM | Year 5+ | Type 1A | 0622573 | IL |

Poster Title: **Merit-Based Immersion Project for Students and Teachers**

Keywords: **Introductory Courses, Faculty & Staff Development, Underrepresented Students**

Poster Abstract: This project permits the expansion and integration of the highly successful Merit Program, which has been used at the University of Illinois at Urbana-Champaign for over a decade. The original target population in the mathematics, chemistry and integrative biology departments includes "high-potential but at-risk" students from among traditionally under-represented as well as rural students. The MIST project has three objectives: 1) To broaden the student base to include the large proportion of students who have not declared their major (undeclared), as well as increasing access among the original target group. 2) To train current and future teachers at the college and high school levels to implement their own Merit-style programs. 3) To develop readily accessible on-line resources and discussion boards for Merit students, and for professionals trained by the project. This online resource, at www.merit.illinois.edu, also includes information for prospective students and their parents.

Of the 234 undeclared freshmen who entered the program in Fall 2007 (Cohort 1), 195 have declared a major and 95 of those (48.7%) chose a STEM major. By contrast, of a comparable group of 683 undeclared freshmen that did not participate in Merit, 581 have declared a major but only 200 (34.4%) chose a STEM major. Of the 239 undeclared freshmen who entered the program in Fall 2008 (Cohort 2), 85 have declared a major and 41 of those (48.2%) chose a STEM major. (A comparison group of non-Merit students from Fall 2008 is still being established and analyzed.) Both of these cohorts exceed our proposed goal of 40%. Merit students, regardless of their cohort, ethnicity, and gender accrued significantly more credit hours total and in STEM courses than those students who were not in Merit. In the undeclared-major sample from Cohort 1, the mean number of STEM courses for Merit students (8.83) was statistically higher ($p < .001$) than the respective average of non-Merit individuals (6.70). This was also evident for Cohort 2; the mean number of STEM courses for Merit students (4.59) was statistically higher ($p < .01$) than the average of non-Merit individuals (3.64). Significant differences in the total courses were evident as well. Merit students also earned higher grade point averages in STEM courses than students who were not in Merit. These average GPA differences were significantly higher for Cohort 1 but not Cohort 2. In STEM for Cohort 1, undeclared students' GPAs were 2.86 versus 2.71, while Cohort 2 undeclared students' GPAs were 2.69 versus 2.64. In the most recent surveys of MIST students (Fall 2009 and Spring 2010) the key influences motivating participation were: better performance in their courses; small group setting using small group learning techniques; and additional structured study time. We also learned that 80% of the students credited the worksheets, created by the Merit TAs, for their improved understanding of the course content. Over 85% of the students indicated that the Merit Program resulted in better to much better exam scores.

We have held three Summer Teacher Workshops (2007, 2008, and 2009) with 101 total participants. The results from the follow-up survey for the July 2009 workshop participants were extremely encouraging. With 37 of the 43 participants responding, 75.7% of the teachers reported that they had changed the instructional strategies used in the classroom, and most credited the 2009 Merit Summer Teacher Workshop as the catalyst for their pedagogical adjustments (including using more critical thinking questions and small groups). Teachers also reported an increased confidence or comfort level with: 1) involving students in topics about which they felt a lack of knowledge, 2) dealing with differing student opinions, and 3) conducting class discussions about students' collected data or observations.

Poster #: N – 01 Session: Lead Institution: **North Seattle Community College**

Authors: **Ann Murkowski**
Wendy Rockhill
Chad Hickox
Peter Lortz

| | | | | | |
|-----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Two Year | All STEM | Year 1 | Type 1A | 0969607 | WA |

Poster Title: **Ready, Set, Transfer! A Collaborative Project to Increase STEM Participation and Transfer in the Seattle Community College District**

Keywords: **Recruitment, Peer Tutoring, UG Research/Internship Opportunitites, Service Learning, Supplemental Instruction, Learning Communities, Introductory Courses, Underrepresented Students**

Poster Abstract: RST (Ready! Set! Transfer!) is a collaborative effort between the three community colleges of the Seattle Community College District. With this award, we are creating an Academy to provide support and mentoring to current and potential STEM students. In particular, the Academy targets students at three key stages in their academic careers. “Ready” students are still in developmental math, and may not have yet thought seriously about a career in STEM. “Set” students are completing their core series in the sciences. “Transfer” students are finishing up their degrees and getting ready to transfer on to 4-year institutions. Students at all three levels are encouraged to join the Academy, which provides a variety of support to them including tutoring, peer and faculty mentoring, learning communities, and a variety of fieldtrips and activities. Academy members also complete a capstone project in leadership, service learning, or undergraduate research as they prepare to transfer to a 4-year institution. The success of this program will be measured by the increased number of students earning AS degrees and transferring in STEM fields.

Poster #: N - 02 Session: Lead Institution: **Tennessee Tech University**

Authors: **Allan Mills**
Sally Pardue
Steve Robinson
Holly Anthony
Chris Wilson

| | | | | | |
|-------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| PhD | All STEM | Year 1 | Type 1A | 0969618 | TN |

Poster Title: **Math Success for STEM Majors**

Keywords: **Math Preparation, Introductory Courses, Student Tracking, Institutional Change**

Poster Abstract: Tennessee Tech graduates, on average, 350 - 400 students in STEM majors annually. The goal of the Math Success for STEM Majors (MSSM) grant is to increase the number of students who obtain a baccalaureate degree in a STEM discipline at TTU to about 560 per year by the end date of the grant.

Previous investigations at TTU have identified success in mathematics classes as a key factor in retaining STEM students through graduation. The MSSM project has six goals: (1) incorporating active learning through the redesign of introductory STEM mathematics courses; (2) implementing just-in-time academic support for students enrolled in all introductory STEM mathematics courses, (3) integrating the STEM disciplines through context-driven math applications within a new introduction to university life course for entering STEM freshmen, (4) articulating mathematics skill-level expectations with selected high schools sending large numbers of STEM freshmen to TTU; (5) implementing a uniform TTU mathematics course placement policy, and (6) developing and implementing a data system that tracks individual student performance and status across the STEM disciplines.

Poster #: N-03 Session: Lead Institution: **California State University - Northridge**

Authors: **Vicki Pedone
Werner Horn
Diane Schwartz**

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 1 | Type 1A | 0969627 | CA |

Poster Title: **Increasing Success in Lower-Division Mathematics at California State University Northridge**

Keywords: **Math Preparation, Introductory Courses, Institutional Change**

Poster Abstract: In its first year, STEPS at CSUN has created institutional change that fosters student success and progress in lower-division mathematics. We use two approaches: 1) improving initial placement in the foundational mathematics sequence, and 2) improving first-time pass rate in foundational math courses through supplementary laboratories. Labs are open to all students, but mandatory for students who just miss a passing grade on Math Placement Test and who are repeating course. To support both of these approaches, we prepared three new course proposal forms and nine course modification forms to create new laboratory classes and make changes in the prerequisite structure for entry into foundational mathematics courses (College Algebra, Trigonometry, Precalculus, Calculus I and Calculus II). All proposals were approved by the University Educational Policies Committee to become permanent components of the mathematics curriculum. The curriculum reform creates a new structure that identifies students as fully prepared or conditionally prepared. This structure allows students who are just below the required prerequisite to advance to the next course if they take the associated laboratory course. Previously, those students would be held back and have to take the lower-level course or to repeat the course. This discourages students from persisting in their STEM major and lengthens the time to graduation. The new labs use online remediation, instructor-proctored collaborative work, and online independent homework. They are being piloted in Spring 2011 with ~36 students in each and will be fully launched in Fall 2011 with about 150 students in each.

Poster #: N-04 Session: Lead Institution: **Bridgewater State College**

Authors: **Thomas King**
Stephen Waratuke
Jeffrey Williams
Matthew Salomone
Jennifer Mendell

| | | | | | |
|------------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Bachelors | All STEM | Year 1 | Type 1A | 0969109 | MA |

Poster Title: **Initial Activities of STREAMS at Bridgewater State University**

Keywords: **Supplemental Instruction, Introductory Courses, Learning Communities**

Poster Abstract: Student Retention Enhancement Across Mathematics and the Sciences (STREAMS) is a first year STEP grant held by Bridgewater State University in southeastern Massachusetts (<http://www.bridgew.edu/STREAMS>). STREAMS implements a common approach to improving student retention in biology, chemistry, computer science, earth sciences, mathematics and physics at BSU that will lead to an approximate increase of 40 STEM graduates annually from an average of approximately 120 to 160 STEM degrees granted per year. Five STREAMS interventions have begun operation this year, including a three-week, residential summer bridge program; course development grants promoting group, inquiry-based pedagogy in introductory STEM courses in each department; the introduction of Structured Learning Assistance (SLA) in all introductory courses with pervasive, high student failure rates; additional transfer student assistance and partnerships with two local community colleges; and an electronic-portfolio based mentoring program. A science and math residential learning community will open in fall 2011. In fall 2010, SLA in introductory biology reduced the rate of student D, F, or W grades from a historic level in excess of 30% to under 15%. In addition, students who participated in the 2010 summer bridge program had a collective STEM DFW rate of 11% in the fall 2010 semester -- well below a matched cohort rate, with only 1 out of 15 students who completed the bridge in academic jeopardy after the fall 2010 semester

Poster #: N-05 Session: Lead Institution: **St. Edward's University**

Authors: **Richard Kopec**

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 1 | Type 1A | 0969153 | TX |

Poster Title: **Community for Achievement in Science, Academics, and Research – Science LLC**

Keywords: **UG Research/Internship Opportunities, Supplemental Instruction, Underrepresented Students, Learning Communities**

Poster Abstract: The St. Edward’s University (SEU) Science, Technology, Engineering, and Mathematics Talent Expansion Program (STEP): CASAR (Community for Achievement in Science, Academics and Research) – Science Living Learning Community (LLC) Project is increasing the numbers and retention of students, particularly women and underrepresented minorities, in the STEM disciplines through an interdisciplinary academic living learning community comprised of faculty, staff and students that supports the academic success of students as they move into, through and beyond SEU. The project (1) attracts, (2) retains, and (3) transitions students into advanced courses and post-graduate success in STEM disciplines. The LLC students enrich their research skills by working in multicultural teams on scientific projects that include cross-disciplinary laboratory experiences. Students begin with a one-week Freshman Accelerated Research Methods (FARM) summer program prior to the start of the regular academic sessions, followed by a year residing in the CASAR LLC. At the end of the first year, interested CASAR students participate in a summer undergraduate research program on campus, mentored by the faculty. During the second year, the students have the option of continuing in the CASAR-Science LLC. In their junior and senior years, students are encouraged to participate in other existing summer undergraduate research projects both locally and at off-campus sites, and serve as mentors to incoming freshmen and sophomore LLC participants. Faculty are intimately involved at all stages of the program along with support staff, such as academic advisors, residence life personnel, counselors, tutors, and the Office of Graduate Fellowships.

Authors: **Alan Niemi**
Robert Warke
Melanie Roudkovski

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | Engineering | Year 1 | Type 1A | 0969382 | TX |

Poster Title: **First-Year Initiatives for Retention Enhancement (FIRE)**

Keywords: **Peer Mentoring, Learning Communities, Introductory Courses**

Poster Abstract: A decline in the annual retention and graduation rates of LeTourneau University's School of Engineering and Engineering Technology (SEET) to significantly subpar levels motivated an internal study of its underlying causes. Analyses of performance and predictor data, as well as surveys of the literature and of non-retained SEET students, produced several recommended actions based on documented best practices. The purpose of this project, First-Year Initiatives for Retention Enhancement (FIRE), is to increase the school's retention and graduation rates. Specifically, the primary goal of this project is to increase the SEET graduation rate from its recent five-year average of 42% to an improved five-year average of 65%.

"First time in any college" (FTIAC) freshmen are the focus of the SEET's retention improvement efforts. To achieve the target graduation rate of 65%, 1-year retention of new students should be increased to 85% from its recent level of 68%. The SEET's multifaceted initiatives for doing so include several best-practice components, namely:

- 1) the development of the faculty mentoring program for first-year students;
 - 2) the development of a peer mentoring program for first-year students;
 - 3) the development of an industrial contact mentoring program for first-year students;
 - 4) exposure to engineering practice through two new courses employing multidisciplinary projects, presentations by practicing engineers, presentations by students involved in co-op education, and presentations by senior capstone design project students.
- First-year interest groups (FIGs) were fully implemented in the 2010-11 academic year as indicated in the proposal, with the exception of the industrial mentor program. All incoming SEET freshmen were grouped into fifteen FIGs according to major and assigned to a peer mentor and a faculty mentor. Each peer mentor interacted with his or her freshmen in group and/or one-on-one meetings on a weekly basis, as well as in occasional social activities. Each peer mentor also met biweekly with the co-PI and with his or her faculty mentor. The project leaders are working closely with the university's Director for Student Achievement to oversee and coordinate the various FIG groups and their respective peer mentors. The university has already adopted several of the project's FIG practices into its own freshman experience course.

Faculty and peer mentor focus groups were conducted to assess the successfulness of the project's first semester. Feedback from these two primary groups provided valuable insight to the components that were most effective, as well as areas for improvement. Faculty mentors acknowledged that students improved in areas such as study skills, and were provided much needed opportunities for interpersonal interactions.

Peer mentors also provided significant feedback, reporting (like faculty) that students' study skills improved as a result of the FIGs. Peer mentors focused on encouraging study groups and implementing opportunities for social interaction. Initial feedback suggests that the study groups appear to be the most effective aspect of the FIG program thus far.

At the end of the Fall 2010 semester, about half of the freshman engineering students completed a FIG survey, providing feedback about personal experiences in the FIG groups. Most students responded that the FIG was a valuable experience in that their peer mentor played a significant role in helping them learn study skills and form social relationships throughout the semester. Study sessions, social activities, university-specific activities, and spiritually-focused activities were several of the items mentioned multiple times as positive experiences in the FIG groups.

A beta version of the first semester engineering practice course was created by modifying our traditional engineering graphics course to include components of engineering practice, focusing on answering the question "what do engineers do?" This offering included both interactive classroom sessions and experiential lab modules exposing students to various fields of engineering.

The course evaluations at the end of the semester indicate that the majority of students considered this an excellent course, which is a significant improvement over the previous offering. Also, a Freshman Engineering Survey was designed to assess majors' awareness of their discipline prior to completion of discipline-specific coursework. The survey was administered toward the beginning of the course and again at the end. A significant correlation existed between the pre- and post-tests. Students' scores improved on items such as, "I expect to be successful in my engineering coursework" and "I think I am good with people." A number of items showed statistically significant improvements, indicating that the course is effectively preparing freshmen for careers as engineering majors. A few challenges have been encountered thus far, mainly associated with the late starting date (August 15th instead of May 1st). We were not able to get our initial entrance survey instrument to those students enrolled in our pilot freshman engineering practice course, until nearly half-way through the semester. Also, we were unable to involve industrial mentors yet in the FIG program. Both of these situations will be remedied in the next project year. Also, during the next academic year we will be able to fully deploy the new engineering practice courses.

Having only completed the first semester in this pilot year of the project, we do not have any retention data to report yet, but as indicated above we have received positive feedback from several groups involved in the project. This preliminary feedback suggests that we can look forward to successful outcomes in the project years ahead.

Poster #: N - 07 Session: Lead Institution: **Milwaukee Area Technical College**

Authors: **Aparna Sen**
Kimberly Farley
Zack Shana

| | | | | | |
|-----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Two Year | Science | Year 1 | Type 1A | 0969360 | WI |

Poster Title: **Biochemical Excellence in Science and Technology**

Keywords: **Recruitment, Peer Tutoring, Peer Mentoring, Articulation & Transfer Issues, Career Counseling, Introductory Courses**

Poster Abstract: Milwaukee Area Technical College (MATC) is addressing local and national initiatives to increase the number of students transitioning to baccalaureate degrees in STEM disciplines through the Biochemical Excellence in Science and Technology (BEST) program. The primary goals of this project are to establish a STEM pipeline focusing on a dual bridge module. Students will transition from high school to MATC for an associate's degree in one of the STEM areas and then transfer to a baccalaureate institution for a four-year degree. This project will focus to strengthen the Associate in Science degree program and offer students different tracks within this degree, most notably in the biochemical sciences. Enrollment in all STEM fields is expected to increase. This five-year project will offer an array of recruitment, academic support and enrichment activities to ensure academic success and stimulate interest as students explore career pathways in science and technology when education and research are integrated. It includes summer workshops for high school seniors, research internships for college students in cooperation with four-year institutions and businesses, and a STEM-focused professional development course for high school teachers and counselors. The program will be open to all, but minorities, women and other under-represented populations will be targeted for recruitment. The BEST program provides a model for integrating student learning and research through development of curriculum and key partnerships with research institutions. The bridge internships will create stronger transfer relationships between MATC and local colleges and universities.

Year 1 activities include:

1. For Milwaukee Area Technical College Students:

- a. Recruitment of MATC students for summer research internships in the biochemical sciences. Timeline- 8 weeks, June-July, 2011.
- b. Biotechnology Club has been formed by the MATC-Associate in Science-Biotech Track students. The purpose of the club is to have guest speakers, participate in field trips, discuss journal articles, job placements.
- c. Articulation discussions with four-year institutions for Associates in Science degree students in the Biotech or Chemtech tracks.

2. High School Recruitment Initiatives:

- a. Summer Workshop- "Laboratory Techniques in Biochemical Research" for high school students is being developed. Timeline-two 2-week sessions in June and July, 2011. Upon successful completion of the workshop, students will receive 1 college credit.
- b. A 3-credit course titled "STEM Applications in Biochemical Sciences" is being developed for high school teachers and counselors. This course will be offered once a semester starting in Fall 2011.

Poster #: N - 08 Session:

Lead Institution: **Salisbury University**

Authors: **Karen Olmstead**
Tom Jones

| | | | | | |
|----------------|---------------------|---------------|----------------|----------------|-----------|
| Inst. Type: | Disciplinary Focus: | Project Year: | Project Type: | Grant #: | State |
| Masters | All STEM | Year 1 | Type 1A | 0969428 | MD |

Poster Title: **Bridges to SUCCESS (Salisbury University's Connections to Careers for Every Stem Student)**

Keywords: **Recruitment, Math Preparation, UG Research/Internship Opportunities, Learning Communities, Articulation & Transfer Issues**

Poster Abstract: The goal of Bridges to SUCCESS (Salisbury University's Connections to Careers for Every Stem Student) is to increase the total number of graduates in selected STEM disciplines by 75%. We hope to achieve this goal within five years by increasing outreach and better targeting recruitment; more seamlessly aligning community college and SU science and math curricula; and employing several strategies to improve retention and graduation rates.

SU's Bridges program launched in May, 2010 with the following activities to increase the number of students graduating with chemistry, physics, mathematics, computer science, and earth science degrees.

1) Science Nights at Salisbury University will be offered each year, free-of-charge to any students in grades 11-12 from counties surrounding SU who have a minimum adjusted GPA of 2.5 in math and science courses. By offering the program as a nightly series (eight per year), we hoped to increase the likelihood that parents would attend with their child. During the first year of Science Nights, we found that we need to more actively recruit participants from a broader region. We have had good success with day-time campus visits from students in local STEM academies, and may try to integrate Science Nights and school visit outreach to maximize the number of students participating in the future.

2) Science Camp@SU will be a one-week summer program held for high school students (rising juniors or seniors) who are considering a science-related field as a possible major and career (scheduled for July 17-21, 2011). Our goal is to recruit 10 to 20 students each year. The camp will use problem-based and object-based learning that purposefully situates scientific inquiry and the application of mathematics and technology in the context of engineering design and problem solving.

3) STEM Curriculum Coordination: In Year 1, we established curriculum coordinating teams for computer science, physics, and earth/environmental science with each team composed of faculty from SU and our two-year partners, Chesapeake College, and Wor-Wic Community College. These inter-institutional teams are working to better align the curricula for introductory and supporting courses in these majors. Math, Chemistry, and Biology curricula are already aligned as an outcome of a previous project. Anticipated completion date is June, 2011.

4) SUCCESS through Improved Retention and Graduation Rates involves several activities including: a) Math Skills Development – all entering first-year students are required to take the ALEKS math assessment, but few choose to complete recommended skills-development modules. We are currently looking at strategies to integrate ALEKS into courses and/or otherwise increase student math skills development; b) Summer Research for First- and Second-Year Students – the grant supports ten student researchers who interact with a community of upper-division research students (who are funded through another mechanism). In summer 2010, ten STEM students participated in the Bridges research program and all but one were retained in their major (one student left campus due to family move); c) A STEM Living-Learning was launched this fall in which STEM students live together on the floor of a newly renovated residence hall, enroll in two common courses (General Chemistry and a specially developed general education course, Nature, Science, Technology in the Making of the Modern World), and engage in various co-curricular activities together (17 students in Fall, 2010; 94% retention rate to spring semester). The STEM LLC will continue next year with Calculus I and the history course; and d) The Center for Applied Math and Science (CAMS) will provide students with opportunities to their mathematical and scientific knowledge and skills on real, not just realistic, problems through a course-based research-team approach to a specific project. In this, the first year, CAMS students will focus on analyzing data from our math placement project to determine how well the placement function works and to assess strategies to increase student engagement with skills modules. Further, new space has been allocated to the Department of Mathematics & Computer Science to develop a student computer lab for the CAMS course and students.