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## AC 2012-5345: LEVERAGING S-STEM SCHOLARSHIP PROGRAMS

### **Dr. Mary R. Anderson-Rowland, Arizona State University**

Mary Anderson-Rowland is the PI of an NSF STEP grant to work with five non-metropolitan community colleges to produce more engineers, especially female and underrepresented minority engineers. She also directs two academic scholarship programs, including one for transfer students. An Associate Professor in computing, informatics, and systems design engineering, she was the Associate Dean of Student Affairs in the Ira A. Fulton Schools of Engineering at ASU from 1993-2004. Anderson-Rowland was named a top 5% teacher in the Fulton Schools of Engineering for 2009-10. She received the WEPAN Engineering Educator Award 2009, ASEE Minorities Award 2006, the SHPE Educator of the Year 2005, and the National Engineering Award in 2003, the highest honor given by AAES. In 2002, she was named the Distinguished Engineering Educator by the Society of Women Engineers. She has more than 175 publications, primarily in the areas of recruitment and retention of women and underrepresented minority engineering and computer science students. Her awards are based on her mentoring of students, especially transfer, women, and underrepresented minority students, and her research in the areas of recruitment and retention. A SWE and ASEE Fellow, she is a frequent speaker on enhancing the transfer experience, career opportunities, and diversity in engineering.

### **Dr. Armando A. Rodriguez, Arizona State University**

Prior to joining the ASU faculty in 1990, Armando A. Rodriguez worked at MIT, IBM, AT&T Bell Laboratories, and Raytheon Missile Systems. He has also consulted for Eglin Air Force Base, Boeing Defense and Space Systems, Honeywell, and NASA. He has published more than 200 technical papers in refereed journals and conference proceedings. He has authored three engineering texts. Rodriguez has given more than 70 invited presentations—13 plenary—at international and national forums, conferences and corporations. Since 1994, he has directed an extensive engineering mentoring-research program that has served more than 300 students. Rodriguez's research interests include control of nonlinear distributed parameter and sampled-data systems; modeling, simulation, animation, and real-time control (MoSART) of Flexible Autonomous Machines operating in an uncertain Environment (FAME); control of bio-economic systems, renewable resources, and sustainable development; and control of semiconductor, (hypersonic) aerospace, robotic, and low power electronic systems. Rodriguez has received the following honors: AT&T Bell Laboratories Fellowship; Boeing A.D. Welliver Fellowship; ASU Engineering Teaching Excellence Award; IEEE International Outstanding Advisor Award; White House Presidential Excellence Award for Science, Mathematics, and Engineering Mentoring; and the Ralf Yorke Memorial Best Paper Prize. Rodriguez has also served on various national technical committees and panels. He is currently serving on the following National Academies panels: Survivability and Lethality Analysis, and Army Research Laboratory (ARL) Autonomous Systems. Personal website: <http://aar.faculty.asu.edu/>.

### **Dr. Richard A. Hall Jr., Cochise Community College**

Richard (Bubba) Hall is the Dean of Math, Science, and Health Science at Cochise College and PI of the NSF Cochise Community College METSTEP program. He is working closely with Arizona State University's METS program and Office of Academic Partnerships to build transfer pathways for Cochise College engineering students to Arizona State. Under his supervision, Cochise College has developed an associate of science degree and associate of applied science degree in engineering, as well as introductory and programming courses for engineering. Hall also plays an important support role in the Running Start program, a college program that gives local high school students an opportunity to pursue an engineering degree at the beginning of their junior year. Most importantly, a team of math, science, and engineering instructors has been formed to help lead all engineering efforts. JoAnn Deakin, Feng Yang, Mark Gibson, and Kristy Ritter have all played important roles in the development of the engineering program at Cochise College.

### **Dr. Phil Blake McBride, Eastern Arizona College**

Phil McBride received a B.S. from the University of Arizona in 1986, a M.A.T. in 1989 from Northern Arizona University, and a Ph.D. in chemistry from Miami University in 2003. He taught high school in Northern Arizona for five years before moving to Eastern Arizona College in 1991 to teach chemistry. He was recognized by the EAC Student Association as the most admired faculty in 1993, received the Alumni

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Faculty Recognition Award in 1996, the Distinguished Service Award in 1997, and in 2008 received the Rocky Mountain Region College Educator Award for Excellence in Teaching by the American Chemical Society. For the past five years, he has served as Dean of Instruction, while continuing to teach at least one course each semester. Dr. Jack Bailey has played an important role in the development of the engineering program at Eastern Arizona Community College.

**Dr. Rakesh Pangasa, Arizona Western College**

Rakesh Pangasa is the PI of the Arizona Western College METSTEP program. After practicing as a scientist, researcher, and industrial R&D manager for 14 years at the Cement Research Institute of India serving cement, concrete, and construction industries, he immigrated to U.S. in 1986 and switched to teaching, training, and consulting. Since then, he has been engaged in teaching mathematics, computer programming, engineering, and objectivism at Arizona Western College and has taught at all the three state universities in Arizona. He has also taught undergraduate and graduate students in business administration, information systems, operations management, and strategic management for Northern Arizona University and for Webster University at their campuses in Yuma, Denver, Vienna, and Shanghai. He has also worked as Commissioning Engineer for FLSmith, training operators at a few plants of American Electric Power, and as Senior Computer Systems Analyst for Yuma proving grounds on future combat systems software interoperability. In his efforts towards motivating high school students to explore engineering, he has launched the first Yuma community robotic team for regional competition. His research interests and passion include building strong relations amongst academics, research, and industry. He earned his bachelor's degree in chemical engineering from Panjab University in 1971 and a Ph.D. in industrial engineering from Indian Institute of Technology (IIT) Delhi in 1986.

**Dr. John M. Saber, Mohave Community College**

John M. Saber is the PI of the Mohave Community College METSTEP program. He worked as a Russian translator in Berlin during the 1970s. He returned to the U.S. in 1976, and after a few years working in counter intelligence, he began work on his Ph.D. in chemical engineering at the University of Colorado in Boulder. Upon graduation, he accepted a postdoctoral position at Los Alamos National Laboratories, working on space-based neutral particle beam guns and on x-ray lasers. In 1989, he joined Exxon Research and Development Labs in Baton Rouge. Having never lost the wanderlust he developed in Germany, he left Exxon after five years and opened dive operations, first in Honduras and later in Bali, Indonesia. While teaching dive math and physics in Bali, he was recruited to teach math at the National Campus of the College of Micronesia in Kolonia, Pohnpei, FSM. John again returned to the U.S. in the summer of 2008 to participate in the presidential elections that year. He taught calculus-based physics, statics, dynamics, materials, and developmental math at Central Lakes Community College in Brainerd, Minn. Having frozen to death several times during the next three years, he accepted employment at Mohave Community College in Kingman, Ariz. During his first semester there, he set up an A.S. program in engineering as part of METSTEP, and thoroughly enjoyed his first winter there. Introduction to Engineering was taught for the first time ever at Mohave in Spring 2012 by Saber with 10 students.

**Prof. Clark Vangilder, Central Arizona College**

Clark Vangilder is the PI of the Central Arizona Community College METSTEP program. Clark is a former Naval Nuclear Propulsion Plant Operator prior to receiving a bachelor's degree in mathematics from Grand Canyon University in 1995 and a master's degree in physics from Arizona State University in 2004. Central Arizona College hired Clark in 2008 to take over the physics program, as well as resurrect the pre-engineering program in conjunction with two separate grant opportunities, one including the exploratory STEP grant that has evolved into METSTEP. In addition to the standard introductory design course which articulates to all three Arizona universities, Clark has created course sequences in MATLAB and Python, which also articulate. In the coming year, new curriculum and an associate's degree will be drafted and submitted for approval. At the present time, Clark is also pursuing a Ph.D. in cognitive psychology in order to promote a new theory of learning, of his design.

**Ms. Anita Grierson, Arizona State University**

Anita E. Grierson has been the Director of the METS Center in the Ira A. Fulton School of Engineering at ASU since 2008. Grierson has more 10 years corporate experience in program management, business

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development, and biomechanical engineering, with products as diverse as air bag systems for helicopters, body armor, and orthopedic implants. She received her bachelor's degree in mechanical engineering from the University of Michigan in 1990, her master's degree in mechanical engineering from Northwestern University in 1994, and a master's in business administration from Arizona State University in 2000.

# **Leveraging S-STEM Scholarship Programs With a STEP Program**

## **Abstract**

In response to our nation's cry for more engineers, this paper describes how a major university has leveraged four NSF program grants to produce a highly successful program focused on retention, graduation, and graduate degrees. One of the programs is for lower division students, one is for upper division transfer students, one is for non-transfer upper division students and graduate students that have come up through the system, and one is for upper division students who come from five selected non-metropolitan community colleges in Arizona. The last program ties everything all together with a Transfer Student Center, a place for the S-STEM Academic Scholarship Success Class to meet, a place to host potential transfer students, and a place for transfer students to study and network. An emphasis of all of these programs is the encouragement and support of female and underrepresented minority students and students with unmet financial need.

These programs have attained a 90-95% retention rate. For upper division transfer students not in the program, the graduation rate is about 70% for males and 64% for females. The transfer GPA shock was shown to be negligent for new program transfer students, compared with a half grade point drop for new upper division transfer students not in the program. Most importantly, during the past three years over 50% of the graduated scholarship students have gone right on to graduate school full-time. Seventy percent of the transfer students who did not intend to go to graduate school when they matriculated to Arizona State University, but who have now chosen to go on to graduate school, have reported that this program was a major influence in this decision change. Several of the students are now in PhD programs preparing to become professors.

Even though parts of this program have been in existence for nearly 10 years, this is a continual work in progress as we strive for more excellence. This paper highlights the successes of being able to leverage four NSF grants. We also discuss areas which are still challenging.

## **I Introduction**

An outstanding, successful model program for engineering and computer science transfer students in the Ira A. Fulton Schools of Engineering at Arizona State University (ASU) has been in development since 2002. This program is helping to meet the need for more engineers in Arizona, especially engineers with advanced degrees. With increasing tuition fees, more and more students are finding themselves unable to meet the financial needs of college. Engineering and computer science are difficult majors and students majoring in these fields find that if they

have to work while going to school, the task is even more difficult. It often takes five years for engineering and computer science students to graduate and many students find it difficult to continue to take loans in order to stay in school. It is not uncommon to find that 80% of the students at a large university need financial help. The National Science Foundation is well aware of the critical need for more engineers in the United States and the need for the availability of more scholarships to help support engineering students. However, just providing money to students does not ensure their success. Henceforth in this paper, the term “engineering” shall include both engineering and computer science.

Research has shown the high school GPA and math SAT scores best predict retention and graduation in engineering, while verbal SAT scores correlated negatively with graduation in five out of eight universities.<sup>1</sup> Other research has shown that “student services focused support and academic courses to help students improve their ability to be successful in applying engineering concepts early in the engineering education” can improve student success and retention.<sup>2</sup> Four NSF grants have been leveraged, NSF S-STEM grants (#0807134, #0728695, and #1060226) with an NSF STEP grant (#0856834), to produce a highly successful program focused on retention, graduation, and graduate degrees. The current system was begun in 2002 with an S-STEM grant (Collaborative Interdisciplinary Research Community – CIRC) for upper division and graduate engineering and computer science students (#0123146). In 2003, an S-STEM grant (#0324212) for upper division transfer students was begun (CIRC/METS – Motivated Engineering Transfer Students). Feeding into the CIRC program is an S-STEM program for lower division engineering and mathematics students (currently #0807134). The original CIRC program was renewed (#0728696) from 2007-2011 and a third CIRC program (#1060226) was begun in Fall 2011. The original CIRC/METS program was renewed (#0728695) for 2008-2012. In 2009, scholarships were added to the mix for upper division students from five non-metropolitan Arizonan community colleges through the STEP grant already mentioned. This last program ties everything all together with a Transfer Student Center, support for Center staff, a place for the S-STEM Academic Scholarship Success Class to meet, a place to host potential transfer students, and a place for transfer students to study and network. In addition, our goal includes building the engineering programs in each of these community colleges (CCs) and increasing the number of transfer students to ASU from these five colleges.

The students in these programs receive \$4,000 scholarships per academic year. The students in the upper division S-STEM programs must be full-time students in engineering. Mathematics students are also accepted from the lower division S-STEM program and can continue in the upper division S-STEM program. The students must be US citizens or permanent residents, have at least a 3.0 GPA, and have unmet financial need according to FAFSA. Since there are more qualified students who apply for the scholarships than there are scholarships, additional students can earn a \$300 scholarship for a maximum of two semesters by completing the Academic Success Class that is required of the \$4,000 scholarship holders each semester that they hold the scholarship. The \$4,000 that the scholarship students receive per academic year covers about

half of the cost of tuition and fees at ASU. The \$4K scholarship is renewal subject to continued eligibility and can be continued for up to four semesters of graduate school in engineering at ASU.

The ASU students in the lower division S-STEM meet six times a year for their own program. All of the ASU upper division and graduate students meet together six times a year with a choice of five meetings times (three on a Thursday and two on a Friday) in order to accommodate all of their schedules. The programming has been described in other papers.<sup>3-18</sup> The students participated in an Academic Success Class each semester to receive help with learning skills, coping skills, resources, and most importantly time management. Addition topics included: resumes, how to work a career fair, what industry looks for in an engineer, internships, research, graduate school, how to apply for graduate school, scholarships, and fellowships. The Academic Success students also prepared a 5-10 page Career Plan for 10 years out after the Bachelor's degree. The students were required to do 10 hours of volunteer work; many chose to do it in the form of tutoring or mentoring.

## **II. Status of Programs**

The status of each program will be described here briefly.

CIRC Program (#0631189): The Collaborative Interdisciplinary Research Community (CIRC) Program has now successfully completed its final year and a new CIRC program was begun in Fall 2011. Scholarships of \$2,000 per semester were given to 72 upper division and graduate students. The program was designed to especially encourage females and underrepresented minority students to study engineering and computer science. Underrepresented minority students include Blacks, Hispanics, and Native Americans. Both females (33.3%) and underrepresented minority students (44.4%) are overrepresented in this program as compared with upper division and graduate engineering students in general and in Ira A. Fulton Schools of Engineering in particular. Of the US citizens and permanent resident undergraduate students in the Fulton Schools of Engineering (not including construction majors), only 18% are female and 23% are underrepresented minority students. Of the corresponding Fulton graduate students, (excluding construction majors), 18% are female and 15% are underrepresented minority students. In addition, we note that 47/72 (65.3%) of the CIRC students are either female or underrepresented minority.

Students come into the CIRC program from four routes: 1) Native (non-transfer) upper division engineering students who apply, 2) Students who successfully completed the lower division S-STEM program and who are now upper division students, 3) CIRC students who graduated and continued on to graduate school full-time at ASU, and 4) CIRC/METS students who graduated and continued on to graduate school full-time at ASU.

Of the 58 undergraduate students given scholarships, only one student left ASU without an engineering degree giving a retention rate of 98.6%. One other student changed her major from

Mechanical Engineering to Mechanical Engineering Technology. Of the 14 students who were in graduate school when they received their first scholarship from this grant, all have completed a degree or are still working on their degree, except for one student. That student completed his BSE in the first CIRC program sponsored by NSF and then entered graduate school under this grant. The student completed three semesters of a Master's degree and then quit to work full-time. Therefore, the overall retention rate to an engineering/computer science degree is 95.8% (69/72), the retention to a STEM degree is 97.2% (70/72), and the retention to at least a Bachelor's STEM degree is 98.6% (71/72).

In addition to graduating the students at a high rate, a major goal of this program was to have as many students as possible go right on to graduate school full-time in engineering after completing their BSE or BS degree. Nationally, this rate is below 20% for all engineering graduates. Of the 58 undergraduate students at this time, 39 have graduated with a BSE in engineering or a BS in computer science. Of these 39 graduated students, 22 (56.4%) have gone right on to graduate school full-time. Four of the 22 students are in PhD programs and eight of the other 18 graduate students have already completed their Master's degree. One of the students who completed his Master's degree is now in a PhD program. Three additional students are completing their Master's degree part-time. Several of the students are in the Fulton 4 + 1 program, which means they can take three courses that double count for a Bachelor's and a Master's degree and so can complete a Master's in one year after receiving their Bachelor's degree. The requirements to be in a 4+1 Program vary by major (i.e. some majors require a 3.5 GPA).

CIRC/METS Program (#0728695): Now in its final year, the CIRC/METS Program is exceptional in quality and excellence. This program is for upper division transfer students, mostly from local community colleges. Although the students must maintain at least a 3.0 GPA to enter and continue in the program, the students are encouraged to have a GPA of at least a 3.5 to better ensure that they are able to be accepted to the graduate program of their choice. The retention-to-graduation program rate is 90-95%, while upper division transfer students outside of this program have graduated at about a 70% rate for men and 64% rate for women. The students are not only graduating but going on to graduate school. Nationally, only about 20% of engineering graduates go right on to graduate school full-time and that rate was 10% for ASU engineering graduates. During the past three years of the CIRC/METS program over 55% of the transfer graduates have gone right on to graduate school in engineering. Other students have earned an MBA or have gone on to graduate school part-time. This program builds on 12 prior/current National Science Foundation (NSF) CSEMS/S-STEM/S-STEP projects (\$6.715M) addressing lower-division, upper-division, and CC transfer needs.

The CIRC/METS (C/M) Program has had a profound impact upon its scholarship students. Nationally, "transfer GPA shock" is a drop in GPA of a half to a full grade point upon transfer to a university from a CC. Since students start their University GPA from scratch, this drop can be devastating. After Fall 2010, a study was done with the 16 new upper division transfer

scholarship students compared with the 183 other new transfer students in engineering. The C/M students suffered no statistically significant lowering of their average GPA, while the other students suffered about a half point (0.445 grade). The much higher graduate rate was already mentioned. A survey showed that 70% of the students in the C/M program now headed for graduate school, had not intended to go to graduate school when they entered the C/M program. The information, encouragement, and word-of-mouth from C/M students who are now in graduate school changed their minds. The director of this program has researched, presented, and published over 170 papers on transfer students, CC transfer students, Academic Success Classes, and other related topics. Due to these papers, schools nationally (several in Texas) are patterning engineering transfer programs after ASU's program.

The CIRC/METS Program especially encourages diverse students to study engineering and to go on to graduate school. In the four years of the present transfer program, the students have been 30% female, 43% underrepresented minority, and 64% of the students have been either female or underrepresented minority. (ASU engineering has 18% female and 21% minority students.). The scholarships help to eliminate the monetary barrier and the METS Center helps to eliminate the social and cultural barrier that upper division transfer students usually face.

The METSTEP Program (#0856834): The five year METSTEP program began in Fall 2009. The Motivated Engineering Transfer Students (METS) Center, sponsored by the METSTEP Program, continues to prove the value of having a center for transfer students, especially new upper division transfer students. The transfer center at ASU provides a supportive place for transfer students and their friends in engineering. Focus groups have shown that engineering students associated with the METS Center adjusted more easily to the many changes they encountered upon transferring to the largest public university in the nation. In Fall 2011, over 300 students (mostly upper division transfers) enrolled in the METS Center with an average attendance of over 45 students/day.

The METSTEP program also focuses on transfer students from five non-metropolitan community colleges: Arizona Western, Arizona Central, Arizona Eastern, Cochise, and Mohave. Through this program, the engineering programs at these colleges are being strengthened and enlarged. For example, Mohave Community College is teaching their first engineering class ever (Introduction to Engineering) for 10 students in Spring 2012. All of the CCs are looking to add Associate Degrees of Engineering or Science which would not require the many hours of general education classes required by an Associate Degree in the state of Arizona. The engineering enrollment has doubled at Eastern Arizona. Cochise is building their engineering program with additional classes and faculty. The number of transfer students from these five schools has grown from 11 students in 2008 to 22 in 2012. Nineteen students from these five schools have received \$4K scholarships in the past two years.

The METSTEP grant also includes \$300 scholarships for transfer students who otherwise qualify for the \$4K scholarship. We have seen that new upper division transfer students can be



encouraged to attend an Academic Success Class based on the word-of-mouth from students who have tried the course. Some students attended the class because they wanted to earn a \$300 scholarship, while many of the transfer students only found out about the \$300 after they had enrolled in the class. The promise of a scholarship may have been an influencing factor for their retention in the class and their incentive to do the assignments. In Fall 2010, 11 students earned \$300 scholarship and in Spring 2011, 6 students earned the \$300. With good advertisement at a transfer orientation at the beginning of the semester, 22 students earned the \$300 scholarship in Fall 2011.

### **III. Challenges**

The following challenges continue:

- Driving three to four hours to visit non-metropolitan colleges. However, the reward of the appreciation of the students being visited by a university mitigates the difficulty.
- Convincing a new transfer student that:
  - time management is essential
  - 18 credit hours per semester are too many, especially if the student is also working 20+ hours per week
  - the best way to get an internship is to go to several career fairs (especially in the fall) and to practice interacting with industry representatives before they become “desperate” to get an internship
  - reading course material before class and doing “bullet point notes” is a good use of their time
  - that it is essential to get to know their professors in order to obtain good letters of recommendation later
  - it is better to spread classes out than to have them all consecutively during the day
  - study groups are essential
  - research is a good experience for all students
- Being too lenient on late assignments for the FSE 394 course. (Starting in Fall 2011, assignments must be on time in order for the student to earn an A+ in the course. This has drastically improved the on-time assignments.)

### **IV. Summary and Conclusions**

The primary value of the S-STEM and METSTEP projects is that with continual encouragement and good information, not only will almost all (95%) students graduate, but many students will also decide to go on to graduate school full-time right after the Bachelor’s degree even if the finances are difficult. Having a \$4,000 scholarship for each of the first two years of graduate school is a large encouragement for the students. For the four years of the CIRC project, 56.4% of the students who have graduated have gone right on to graduate school. There are now nine students from this program working on their PhD. In the first three years of the present CIRC/METS program 59% of the graduates have gone on to graduate school (48% to ASU). Six

of these students are in PhD programs. This is remarkable when we realize that some of these students are first generation students and all have unmet financial need. The successes of the upper division transfer programs are being presented and published.

Through our 'Guaranteed 4.0 Plan' with the S-STEM and METSTEP Program, students are doing better, getting more sleep, reducing their stress, and enlarging their vision for opportunities related to engineering and computer science. New upper division \$4K scholarship students did not suffer statistically significant transfer GPA shock in Fall 2010. The other new upper division students in engineering and computer science suffered a loss of about a half grade point (very significant).

These programs show that students from community colleges can attend graduate school at the same rate as non-transfer students in a scholarship program (which is much higher than the national average of only about 20%). Both transfer and non-transfer \$4K scholarship students, all with unmet financial need are attending graduate school at the rate of over 50%. Additional students are earning engineering graduate degrees part-time or earning an MBA.

Multiple university and college leaders have reported using parts of our METSTEP Program to write a successful proposal to also get money to help support engineering and science students. The results of this program in terms of high retention to graduation and high percentage attendance in graduate school show that a program with leaders that strongly encourage students and help them believe in themselves can be very effective. The presentations and publications from our work have been noted by other engineering schools and they have duplicated many parts of our work. We are increasing the number of engineers and graduate engineering students to provide engineering and technology leaders for the United States. In addition, these students are becoming better informed citizens who will help decide the US future.

We hope to be able to continue these excellent programs for many years. The METSTEP program is funded through the 2013-2014 year. The CIRC program is funded through the 2014-2015 year. Additional funding needs to be found for the CIRC/METS and lower division S-STEM programs for their continuation after the 2012-2013 academic year.

## References

1. Zhang, G., Anderson, T., Ohland, M., Carter, R., and Thorndyke, B., "Identifying Factors Influencing Engineering Student Graduation and Retention: A Longitudinal and Cross-Institutional Study", (2002) Annual American Society for Engineering Education Conference Proceedings, Montreal, Quebec, 14 pp.
2. Sleeman, K.A. and Sorby, S. A., "Effective Retention Strategies for Engineering Students", (2007) International Conference on Engineering Education – ICEE 2007, Coimbra, Portugal, 5 pp.
3. Anderson-Rowland, M.R.; Grierson, A.E., "Evaluating a University Community College Collaboration for Encouragement of Engineering and Computer Science Transfer Students", (2010). Annual American Society for Engineering Education Conference Proceedings, Louisville, KY, 12 pages

4. Anderson-Rowland, M.R., Rodriguez, A.A.; Grierson, A.E., "Motivated Engineering Transfers - STEM Talent Expansion Program (METSTEP)", (2010). Annual American Society for Engineering Education Conference Proceedings, Louisville, KY, 13 pages
5. Anderson-Rowland, M.R., "Reducing GPA Shock for Engineering and Computer Science Community College Transfer Students", (2011). Annual American Society for Engineering Education Conference Proceedings, Vancouver, British Columbia, Canada, 10 pages
6. Anderson-Rowland, M.R.; Rodriguez, A.A.; Bailey, J.H.; Grierson, A.E.; Pangasa, R.; Vangilder, C.; McBride, P.; and Hall, R.A., "STEP Grant Challenges and Results", (2011). Annual American Society for Engineering Education Conference Proceedings, Vancouver, British Columbia, Canada, 13 pages.
7. Anderson-Rowland, M.R.; Rodriguez, A.A.; and Grierson, A.E., "Making a Difference: How to Recruit More Community College Women and Underrepresented Minority Students into Engineering and Computer Science", (2011). Annual American Society for Engineering Education Conference Proceedings, Vancouver, British Columbia, Canada, 9 pages.
8. Anderson-Rowland, M.R.; Grierson, A.E.; Pangasa, R.; Vangilder, C.; and Hall, R.A., "Exploring Collaborations with Non-Metropolitan Community Colleges to Graduate More Engineering and Computer Science Students with Bachelor's and Graduate Degrees", (2011). Conference Proceedings, Annual 2011 American Society for Engineering Education Conference Proceedings Vancouver, British Columbia, Canada, 13 pages.
- 9.. Anderson-Rowland, M.R., "Evaluation of a Ten Year Life Planning Assignment for an Academic Scholarship Success Class", (2011). 40th ASEE/IEEE Frontiers in Education Conference; Rapid City, S.D. 6 pages.
10. Anderson-Rowland, M.R., "Are Engineering and Computer Science Women Students Good Predictors of their Semester GPA?", (2011). WEPAN Proceedings, Seattle, WA, 12 pages.
11. .Anderson-Rowland, Mary R., "Retention, Graduation, and Graduate School: A Five-Year Program Focusing on Women and Underrepresented Minority Engineering and Computer Science Students", *ASEE 2008 Annual Conference Proceedings*, June 2008, 11 pages.
12. .Anderson-Rowland, Mary R., "How Did They Fare: Women and Underrepresented minority Engineering and Computer Science Students in a Five-Year Program", *Proceedings of the 2008 WEPAN Conference*, June 2008, 11 pages.
- 13 .Anderson-Rowland, Mary R., "Thinking About Graduate School", *Proceedings of the 2008 American Society for Engineering Education Annual Conference & Exposition*, June 2008, 16 pages.
- 14 .Anderson-Rowland, Mary R. and Sharp, Julie E., "Helping Students (and Ultimately Faculty) Write an Effective Recommendation Letter", *38<sup>th</sup> ASEE/IEEE Frontiers in Education Conference*, October 2008, 5 pages.
15. .Anderson-Rowland, M.R., "An Evaluation of Academic Scholarship Programs by Program and Ethnicity," *American Society for Engineering Education Annual Conference*, Louisville, KY, June 2010, 16 pages.
16. .Anderson-Rowland, M.R., "A Qualitative Evaluation of an Academic Scholarship Program," *40<sup>th</sup> ASEE/IEEE Frontiers in Education Conference*, Washington, DC, October 2010, 6 pages.
17. .Anderson-Rowland, M.R., "Are Engineering and Computer Science Women Students Good Predictors of their Semester GPA?" *2011 WEPAN Conference Proceedings*, Seattle, WA, June 2011, 13pages.
18. . Anderson-Rowland, M.R., "Evaluation of a Ten Year Life Planning Assignment for an Academic Scholarship Success Class," *4<sup>1st</sup> ASEE/IEEE Frontiers in Education Conference*, Rapid City, SD, October 2011, 6 pages.