

Establishing a Win-Win Partnership between a University and Non-metropolitan Community Colleges

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Mary Anderson-Rowland, Arizona State University MARY R.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 three 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 2009-2010. 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 over 185 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 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 career opportunities and diversity in engineering.

Dr. Armando A. Rodriguez, Arizona State University

Prior to joining the ASU Electrical Engineering faculty in 1990, Dr. 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 over 200 technical papers in refereed journals and conference proceedings – over 60 with students. He has authored three engineering texts on classical controls, linear systems, and multivariable control. Dr. Rodriguez has given over 70 invited presentations - 13 plenary - at international and national forums, conferences and corporations. Since 1994, he has directed an extensive engineering mentoring-research academic success and professional development (ASAP) program that has served over 500 students. These efforts have been supported by NSF STEP, S-STEM, and CSEM grants as well as industry. Dr. Rodriguez' 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); design and control of micro-air vehicles (MAVs), control of bio-economic systems, renewable resources, and sustainable development; control of semiconductor, (hypersonic) aerospace, robotic, and low power electronic systems. Recently, he has worked closely with NASA researchers on the design of scramjet-powered hypersonic vehicles. Dr. Rodriguez' honors include: 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; Ralf Yorque Memorial Best Paper Prize. Dr. 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, Army Research Laboratory (ARL) Autonomous Systems. Dr. Rodriguez received his Ph.D. in Electrical Engineering from the Massachusetts Institute of Technology in 1990. Personal Web site: <http://aar.faculty.asu.edu/>

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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 5 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 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. He has presented at the Southeastern Arizona Teachers Academy, the ASTA Annual Conference, NSTA, ACS, and the Biennial Conference on Chemical Education (BCCE). He is a member of ASTA, NSTA, ACS, and 2YC3. He is the current membership secretary of ASTA, a position which he has held since 2010. He has been a volunteer with the Boy Scouts of America for the past 20 years. For the past 7 years, he has served as Dean of Instruction, while continuing to teach at least one course each semester.

Dr. Rakesh Pangasa, Arizona Western College

Rakesh Pangasa, Arizona Western Community College PAKESH PANGASA is the PI of the Arizona Western College METSTEP program. After practicing industrial R&D management in cement, concrete, and construction industries for 14 years at the Cement Research Institute of India, he switched, in 1986, to teaching, training, and consulting. Since then he has been engaged in teaching mathematics and engineering 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 had launched the first Yuma community robotic team for regional competition. His research interests and passion include building strong relations among academics, research and industry. He earned his Bachelor's Degree in Chemical Engineering from Panjab University in 1971, and Ph.D. in Industrial Engineering from Indian Institute of Technology (IIT) Delhi in 1986.

Prof. Clark Henson Vangilder, Central Arizona College

Prior to obtaining a BS in Mathematics in 1995, I served in the US Navy as a Submarine Nuclear Propulsion Plant Operator from 1985 – 1991. Subsequent to the BS degree, I obtained employment with DeVry University from 1998 – 2008; during which, I completed a Master's degree in Physics, with an emphasis on Physics Education. Since 2008, I have been the Professor of Physics at Central Arizona College. Current projects include the development of engineering AS degree, and management of an NSF grant in partnership with ASU's Fulton School of Engineering, for Motivated Engineering Transfer Student Talent Expansion Program (METSTEP). Finally, in the fall of 2011, I began a PhD program in General Psychology with an emphasis in Cognition & Instruction, and am set to complete it December of 2014.

Dr. Russell Cox, Mohave Community College

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RECENT PUBLICATIONS • Russell Cox, Fabien Josse, Stephen Heinrich, Isabelle Dufour, Oliver Brand, "Characteristics of Laterally Vibrating Resonant Microcantilevers in Viscous Liquid Media", Journal of Applied Physics, 111 (1), 2012, 14 pages, jap.aip.org • Russell Cox, Jinjin Zhang, Luke Beardslee, Fabien Josse, Stephen Heinrich, Oliver Brand, Isabelle Dufour, "Damping and Mass Sensitivity of Laterally Vibrating Resonant Microcantilevers in Viscous Liquid Media," Frequency Control Symposium (FCS), 2011 IEEE International, 2011, 6 pages, ieeexplore.ieee.org • Russell Cox, Fabien Josse, Stephen Heinrich, Isabelle Dufour, Oliver Brand, "Resonant microcantilevers vibrating laterally in viscous liquid media," Frequency Control Symposium (FCS), 2010 IEEE International, June 1-4, 2010, 5 pages, ieeexplore.ieee.org • Russell Cox, Mike Wenzel, Fabien Josse, Stephen Heinrich, Isabelle Dufour, "Generalized Model of Resonant Polymer-Coated Microcantilevers in Viscous Liquid Media" Analytical. Chemistry, 80 (15), 2008, 7 pages, pubs.acs.org/journal/ancham • Russell Cox, Mike Wenzel, Fabien Josse, Stephen Heinrich, Isabelle Dufour, "Generalized Characteristics of Resonant Polymer-Coated Microcantilevers in Viscous Liquid Media," Frequency Control Symposium, 2007 Joint with the 21st European Frequency and Time Forum. IEEE International, May 29-June 1, 2007, 5 pages, ieeexplore.ieee.org

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Establishing a Win-Win Partnership between a University and Non-metropolitan Community Colleges

Abstract.

In 2008-09, the Ira A. Fulton Schools of Engineering carried out a pilot program with three non-metropolitan community colleges (CCs) to develop a win-win partnership that would produce more engineering and computer science students. This pilot program was followed with the award of a five-year National Science Foundation STEP grant starting in fall 2009. In this program, two additional non-metropolitan CCs were included.

This paper will describe the major accomplishments of this program as well as major lessons learned. These accomplishments include that all five CC schools now have engineering programs; one school encouraged students to select a major and as a result, the number of engineering majors has grown substantially; Associate Degrees in Science or Engineering has been added by some schools which more closely follow the first two years of an engineering program and thus facilitates transfer; and an engineering or computer science “curriculum pathway” is being instituted to better advise CC students who wish to earn a Bachelor’s degree in these majors. The challenges will also be discussed.

I. Introduction

During the 2002-2003 academic year, an upper division CCEMS scholarship program for engineering and computer science majors was begun at Arizona State University (ASU) sponsored by National Science Foundation (NSF) grant #0123146. Half of the students in the first program were transfer students highlighting the fact that there were many transfer students who were seeking assistance with their academic career. The next year a second scholarship program for engineering and computer science was funded by NSF (S-STEM grant # 0324212) for upper division transfer students. Henceforth in this paper, the term “engineering” shall include computer science which is a part of the ASU’s Ira A. Fulton Schools of Engineering. The first program continued for native upper classmen and for graduate students of the program whether natives or transfers. The primary emphases of the programs were graduation with a Bachelor’s degree, professional development, and students going directly to graduate school after graduation. These programs were successful with nearly 95% graduation rates and higher rates than usual of students going on to graduate school. In these first programs, 30% of the transfer students went right on to graduate school full-time in engineering and 40% of the native students went right on to graduate school full-time in engineering. The first two C-CEMS grants were followed by S-STEM grant #0728695 for native upper division students and graduate students and grant #1060226 for upper division transfer students. The students supported by these grants continued to graduate at a rate of 95%. In addition, 50% of both native and transfer students are going directly to graduate school after graduation.

The state has 21 community colleges (CCs), with 10 of them being local to ASU. The transfer students in the scholarship program were mostly from the local CCs. This was natural and

expected. About the same time as the scholarship programs began, ASU collaborated with six of the local CCs with NSF support (grant #0315817) to help increase the number of engineering students. A small Center for transfer students was established at ASU and liaisons established at each of the CCs. Representatives from ASU visited the CCs and working with the local liaison put on “Be An Engineer” events. The event was advertised through math and science classes as well as signage on the campus. Some professors excused their classes and gave extra credit for their students to attend. As students came in and registered, often there were engineering displays, and manned tables for financial aid, admissions, or a particular engineering major. Information about engineering in general was presented and a panel including engineering students and professions addressed the students and answered questions. Pizza was served after the program. Attendees were invited to come to ASU for an open house in the Transfer Center and also given numbers to call for additional information. This mode of reaching students worked quite well with student attendance at the CC ranging from 30 to 100.

As the grant concluded, ASU continued to participate in events similar to “Be An Engineer” at the local CCs, but also became concerned about the CCs in non-metropolitan areas: CCs that were not visited by any university engineering people.

II. Establishing a Win-Win Major University/Community Colleges Collaboration

An obvious first step for a university/CCs collaboration was identifying the players.¹ The first author engineering professor who had worked with the local CCs, next made contacts at the non-metropolitan CCs. ASU was first awarded a one-year grant to pilot a collaboration between three CCs and ASU. Ten non-metropolitan CCs were invited to participate, but only three responded quickly, with passion, and helped to form the first collaboration. Basic rules that were set forth included:

- The collaboration was “win-win”
- The CCs would host engineering representatives to come to their campus to talk to their students
- ASU representatives would encourage the CC students to stay at the CC as long as they could take courses toward an engineering degree
- ASU would assist the CC to present engineering to local high schools

These rules ensured that the program was “win-win” for both the university and the CCs. We soon learned that the “Be An Engineer” events that worked well at a local, metropolitan CC did not work well at a non-metropolitan CC, primarily because fewer students are on campus at any one time. However, going into mathematics and science classrooms with captive audiences, is a good way to help make students aware of engineering and an effective use of ASU professors’ time after driving three hours or more to the CC campus.

The collaboration of the university with the non-metropolitan colleges was established with good-will from day one and has continued this way ever since. The mutual efforts have been beneficial to both parties: the CCs have grown their engineering programs and recruitment and ASU (and other universities) have gained more engineering students from the CCs. After a

successful working model had been established with the three CCs, two additional CCs joined the collaboration and the six schools were funded by a five-year NSF STEP (grant #0856834).

III. The STEP Program

The STEP program includes collaborative events and events at each individual campus.² Visits are made each semester by ASU professors to each of the CCs. The CC liaison arranges for math, science and engineering classroom visits by ASU professors and staff. A major goal of the university visits to the CCs is to get students to consider engineering as a career. The major goal of the CC visits to ASU is to meet successful transfer students from their school, to meet students in their major of interest, and to learn more about what is needed to transfer. In addition to information about financial aid, the students are warned about early deadlines for scholarships. During the visit, the potential transfer students see the Motivated Engineering Transfer Students (METS) Center and meet people who will be their supporters if they choose to transfer.

The METS Center³ is the central hub for the engineering transfer students. The Center includes a reception desk, an office for the METS Director, a seminar room for class meetings, and space with computers, printers, and study and networking space. The Center supports 30-40 students per day, almost capacity. Each semester 300-400 students use the Center, seventy percent of which are transfer students. The Center is run day to day by transfer students who have been hired to direct a mentoring program, help with events, grade class assignments, and act as resources for any student needing help. The Center Director is an engineer with industry experience and a Master's degree in engineering. This background is very important for successful mentoring of the students who frequent the Center.

A two-credit Academic Success and Professional Development (ASAP) class is offered each semester. Scholarships of \$2,000 per semester are given to upper division native and transfer students, as well as graduate students who have gone through the undergraduate program with funding from two S-STEM NSF grants.⁴ In addition, students graduate to this class from a similar lower division Academic Success and Professional Development class taught by the first co-author. Some scholarship money is available from the STEP grant to support students from the five CCs associated with the STEP grant. Students who receive these scholarships attend the ASAP class as part of their scholarship. Students without scholarships are also encouraged to attend the class. Typically half of the class are students without scholarships, but who have heard good things about the class by word of mouth or have been advised by an academic advisor to enroll. Through the class assignments, the students are asked to do items that are helpful for their success as an engineering student. The purposes of the class are to:

- Graduate the student in engineering,
- Develop the student professionally with subjects not taught in the classroom, and
- Send the graduated student directly to graduate school full-time.

The class is built on the "Guaranteed 4.0 Plan" by Donna O. Johnson.⁵ This system has an excellent time management plan and teaches the students "how to learn" and how to earn and maintain a straight "A" average. Other topics include: resumes, elevator speeches, how to work a career fair, portfolios, the 4+1 plan, graduate school, research, career plans for 10 years after the

Bachelor's degree, internships, success tips, and networking. Special speakers include engineers from industry with graduate degrees.

Mentoring is a second important component of the Academic Success Program. Mentoring is provided through the STEP directors, the METS Center Director, the student workers in the Center, and through the ASAP class. As a part of the 10 hours of volunteer time required by the ASAP class, all students in their first or second semester at ASU are assisted to be paired with a more senior student in the class as a mentor. We are currently piloting a similar mentoring program for all ASAP students with faculty members.

Money for administration and scholarships for the program is the third part of the program. The administration support for the program is provided by the NSF STEP grant. The administration includes two professors, the Center Director, a half-time graduate student, and transfer students (preferably) as a course grader and assistants in the Center. The scholarship money has been provided by the NSF CSEMS, S-STEM, and STEP grant. As these grants have been concluding, we received a scholarship gift of \$100,000 from the University Women & Philanthropy group by winning their annual contest in 2012. The scholarship amount of \$4,000 per year is a considerable help for students when the annual tuition and fees are around \$10,000 per year. Over 90% of all CC transfer students are estimated to have unmet financial need. Students who do not have enough money to go to school often do not go on to school or they work to support themselves while in school. Often they work too many hours to do well in their studies or tend to take too many credit hours in order to get through school faster. The students are also incentivized to do well in their classes in order to keep their scholarship. A 3.0 minimum GPA is required for the scholarship. Because we have many more students apply and qualify for scholarships than we can support, we began \$300 scholarships several years ago to award to students who qualify for the larger scholarship and who enroll in the ASAP class and earn an "A".⁶ Students can receive this scholarship for a maximum of two semesters. The ASAP class helps the students with their academics and also to get summer internships or research positions to also help with the finances.

Research is a fourth part of this program. Over 60 related publications have resulted from our work over the past 10 years. We have published about the program, what we have learned,⁷ what challenges we have had,⁸ and the successes of our work.⁹ Our publications have included our program details,¹⁰ why students are interested or not interested in engineering,¹¹ how to determine the CC audience,¹² critical questions to which students need answers,^{13,14} how to get students to consider their future career,^{15,16} and how to get more students interested in graduate school.¹⁷ Many of these results have also been analyzed by ethnicity and gender.

IV. Challenges

We have been fortunate to have the best resources a program can have: passionate, capable partners. However, there have been some ongoing challenges. First, there have been administrative changes at all five CCs, with major changes at four of them. To date, the changes have been positive for the program, but with each change there is time that must be taken to get a new person up-to-speed. A major positive change has been that Mohave College has now established an engineering emphasis and a full-time engineering professor to lead this effort. An

“Introduction to Engineering” was taught for the first time at Mohave about a year and a half ago. This fall the first of these students transferred to ASU. The chief academic officer of each CC is a part of the Internal Advisory Board as required by NSF and some of these positions have changed as well as those of the liaison. It is very important that the liaison at each CC has the full support of their chief academic officer.

We have discussed the importance of the scholarships to this program. Scholarship support is the hardest part of the program to sustain. The NSF scholarship monies have been essential. Currently we are hoping to be able to continue the STEP program centered around more research on CC students with NSF funding and we are working with private non-profits for support. We have also asked our Industry Board to consider supporting the program with summer internships and a follow-up scholarship for each intern.

Sustainability of the program has been a continual issue. The program has functioned for the past five years similar to an Honors College in a university. An Honors College is not for all students, however, some students thrive in an Honors College. Our Academic Success and Professional Development program and class is not for all students, not even for all transfer students. Our engineering school receives over 400 new transfers each fall, with this number on the increase. Graduate school is not for all students. However, our program has been instrumental in changing the lives of many transfer students. Ninety-five percent of the transfer students are graduating in this program and 50% are going right on to graduate school: remarkable results for students who all have unmet financial need. In addition, 60% of these scholarship students are either female or underrepresented minority, or both. Seventy percent of the students attending graduate school, who did not originally intend to do so, credit the Academic Success Program for changing their mind. Our present challenge is to at least maintain the program at its present level.

The METS Center space is provided by the engineering college, which also pays the utilities and phone for the facility. The rest of the program has been paid through grants and gifts.

V. Successes and Lessons Learned

Engineering majors have been established in all five CCs. In one school students had to be an engineering major in order to be eligible for scholarships which are available at the CC. This gave students a reason to declare engineering as a major and made it easier for the school to document the growing number of students interested in engineering.

Some of the CCs have added an Associate Degree in Science or Engineering which has made it easier for students who want to earn an Associate Degree to do so without having to take a lot of courses which do not support an engineering degree. Work is almost completed for “Engineering Pathways” which give programs of study for all engineering and computer science degrees at ASU outlining exactly which courses can be taken at each community college and which courses will be needed at the ASU for a Bachelor’s degree. Along with this project, it is expected that engineering courses not available at the CC can be taken at ASU and reverse transferred to the CC so the student can also receive an Associate’s degree from their CC.

Although general “Be An Engineer” events do not work well at the non-metropolitan CCs, going into the classrooms has been effective. One CC which had several math and science classes meeting during the noon hour held a meeting in the cafeteria for these classes and served pizza. These meetings are successful if the instructor of the math or science class is also at the meeting and notes the attendance (otherwise some students just leave). Although some professors were very reluctant to give us much class time in the beginning, after they have heard our message most have become very supportive and will arrange for us to have an entire class period when we visit once a semester. During these presentations, we emphasize the importance of taking more mathematics and science classes and encourage the students to stay at the CC as long as they can make progress towards an engineering degree.

The late application each semester of transfer students has been a problem. Students mistakenly believe that they need to complete all of their courses at the CC before they can apply for admission to the university. With our warning to the students with whom we come in contact, as well as a flyer giving a time schedule for applying to ASU, potential transfer students are applying earlier.

Students in small towns now have engineering on their radar. These CC students had never had a university engineering professor visit at their school before the STEP program. The number of engineering and computer science transfers to ASU each year from these target schools has doubled in the past five years: from 80 to 160 students.

VI. The Future

Sustainability has always been an issue. The Dean’s Office has now committed to maintaining the transfer center if funding is no longer available. They have begun by supporting the grader for 20 hours/week for the ASAP course. It is expected that this support will continually increase to cover the transfer students who help run the METS Center. In order to sustain ASAP courses for transfer students, two sections of a one credit Academic Success course for transfer students were sponsored by the Dean’s Office for fall 2013 and one section for spring 2014. These are the first classes provided specifically for transfer students outside of those supported by the National Science Foundation.

The problem of the distance factor between schools will hopefully be partially solved by the addition of teleconferencing equipment in the seminar room of the transfer center. This would allow us to do live video conferencing with potential transfer students at their respective colleges. By having our own equipment, we would not have to worry about the time difference in class schedules between the CCs and ASU. We hope to interact with the STEM and engineering clubs at the CCs.

We hope to be able to continue the STEP program, with the addition of two additional CCs, with passionate, capable engineering professors. We are working to find additional money for scholarships from private non-profits and from our Industrial Advisory Board.

References

1. Anderson-Rowland, M.R., "Exploring Strategies for a University/Non-Metropolitan Community College Collaboration," *Proceedings of the 2010 WEPAN Conference*, Baltimore, MD, April 2010, 10 pages, www.wepan.org
2. Anderson-Rowland, M.R. and Rodriguez, A.A., "Motivated Engineering Transfers – STEM Talent Expansion Program (METSTEP)," *Proceedings of the 2010 American Society for Engineering Education Annual Conference & Exposition*, Louisville, KY, June 2010, 12 pages, CD-ROM and www.asee.org
3. Anderson-Rowland, M.R., Banks, D.L., Zerby, D.L., and Chain, E.L., "The METS Center: A Place Where Community College Transition Students Encourage Each Other in Obtaining an Engineering Degree," *Proceedings of the 2005 WEPAN/NAMEPA Joint Conference*, Las Vegas, Nevada, 11 pages.
4. Anderson-Rowland, M.R., Grierson, A.E., Rodrigues, A.A., et al, "Exploring Collaborations with Non-Metropolitan Community Colleges to Graduate More Computer Science Students with Bachelor's and Graduate Degrees: Two Years Later," *2011 American Society for Engineering Education Proceedings*, British Columbia, Canada, 14 pages.
5. Johnson, D.O. & Chen, Y.C., (2004) *Guaranteed 4.0 Plan*, DJYC Studios.
6. Anderson-Rowland, M.R. and Grierson, A.E., "Evaluating a University/ Community College Collaboration for Encouragement of Engineering and Computer Science Transfer Students," *Proceedings of the 2010 American Society for Engineering Education Annual Conference & Exposition*, Louisville, KY, June 2010, 13 pages, CD-ROM and www.asee.org
7. Anderson-Rowland, M.R., Rodriguez, A.A., Grierson, A.E., Hall, R.A., McBride, P.B., Bailey, J.H., Pangasa, R., Vangilder, C., and Cox, R., (2013) "METSTEP: Third Year Review," *2013 American Society for Engineering and Education Proceedings*, Atlanta, GA.
8. Anderson-Rowland, M.R., Rodriguez, A.A., Bailey, J.H., Grierson, A.E., Pangasa, R., Vangilder, C., McBride, R.B., and Hall, R.A., "STEP Grant Challenges and Results: Motivated Engineering Transfer Students From Non-Metropolitan Community Colleges," *2011 American Society for Engineering and Education Proceedings*, Vancouver, British Columbia, Canada, June 2011, 13 pages. www.asee.org
9. Anderson-Rowland, M.R. and Grierson, A.E., "Exploring Collaborations with Non-Metropolitan Community Colleges to Graduate More Engineering and Computer Science Students with Bachelor's and Graduate Degrees: Two Years Later," *2011 American Society for Engineering and Education Proceedings*, Vancouver, British Columbia, Canada, June 2011. www.asee.org
10. Anderson-Rowland, M.R., "A Qualitative Evaluation of an Academic Scholarship Program," *40th ASEE/IEEE Frontiers in Education Conference*, Washington, DC, October 2010, 6 pages, <http://fie-conference.org/fie2010/>
11. Anderson-Rowland, M.R., Rodriguez, A.A., and Grierson, A.E., "Why Some Community College Students Choose Engineering and Some Don't," *2013 American Society for Engineering and Education Proceedings*, Atlanta, GA.
12. Anderson-Rowland, M. R., Rodriguez, A. A., and Grierson, A. E., "Determining the Community College Audience," *2012 American Society for Engineering and Education Proceedings*, San Antonio, TX, June 2012, 11 pages.
13. Rodriguez, A. A. and Anderson-Rowland, M. R., "Critical Questions to Which Engineering Students Need Answers," *2012 American Society for Engineering and Education Proceedings*, San Antonio, TX, June 2012, 8 pages.
14. Rodriguez, A. A. and Anderson-Rowland, M.R., "Critical Questions of Engineering Students by Gender and Ethnicity," *2012 Proceedings of Frontiers in Education*. Seattle, Washington, October 2012, 6 pages.
15. Anderson-Rowland, M.R. and Rodriguez, A.A., "Life Planning for Engineering Students," *39th ASEE/IEEE Frontiers in Education Conference*, San Antonio, TX, October 2009, 6 pages, <http://fie-conference.org/fie2009/>
16. Anderson-Rowland, M.R., "Evaluation of a Ten Year Life Planning Assignment for an Academic Scholarship Success Class," *41st ASEE/IEEE Frontiers in Education Conference*, Rapid City, SD, October 2011, 6 pages. <http://fie-conference.org/fie2011/>

17. Anderson-Rowland, M.R., "A Successful 4-Year Academic Scholarship Program for Upper division Engineering and Computer Science Non-Transfer Students and Graduate Students," *2012 American Society for Engineering and Education Proceedings*, San Antonio, TX, June 2012, 9 pages.