



## **Sharing Best Practices Toward Seamless Transfer of Engineering Students**

**Dr. Peter Golding, University of Texas, El Paso**

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Bachelors of Science in Mech Engineering, Master of Arts in Political Science, currently pursuing PhD degree in Engineering Education. Director of Corporate Relations for College of Engineering at the University of Texas at El Paso, and Coordinator for the Research Institute for Manufacturing and Engineering Systems.

**Mr. Mike Thomas Pitcher, University of Texas, El Paso**

Mike Pitcher is the Director of Academic Technologies at the University of Texas at El Paso. He has had experience in learning in both a traditional university program as well as the new online learning model, which he utilizes in his current position consulting with faculty about the design of new learning experiences. His experience in technology and teaching started in 1993 as a student lab technician and has continued to expand and grow over the years, both technically as well as pedagogically. Currently he works in one of the most technically outstanding buildings in the region where he provides support to students, faculty, and staff in implementing technology inside and outside the classroom, researching new engineering education strategies as well as the technologies to support the 21st century classroom (online and face to face). He also has assisted both the campus as well as the local community in developing technology programs that highlight student skills development in ways that engage and attract individuals towards STEAM and STEM fields by showcasing how those skills impact the current project in real-world ways that people can understand and be involved in. As part of a university that is focused on supporting the 21st century student demographic he continues to innovate and research on how we can design new methods of learning to educate both our students and communities on how STEM and STEAM make up a large part of that vision and our future.

**Prof. Oscar Antonio Perez, University of Texas, El Paso**

Mr. Oscar Perez received his B.S. and Masters in Electrical Engineering from the University of Texas at El Paso with a special focus on data communications. Awarded the Woody Everett award from the American Society for engineering education August 2011 for the research on the impact of mobile devices in the classroom. He is currently pursuing a PhD in Electrical and Computer Engineering. Mr. Perez has been teaching the Basic Engineering (BE) – BE 1301 course for over 7 years. Lead the design for the development of the new Basic Engineering course (now UNIV 1301) for engineering at UTEP: Engineering, Science and University Colleges. Developed over 5 new courses, including UTEP technology & society core curriculum classes specifically for incoming freshman with a STEM background. Mr. Perez was awarded the 2014 "University of Texas at El Paso award for Outstanding Teaching". Mr. Perez has eight years of professional experience working as an Electrical and Computer Engineer providing technical support to faculty and students utilizing UGLC classrooms and auditoriums. Mr. Perez is committed to the highest level of service to provide an exceptional experience to all of the UGLC guests. Mr. Perez strongly believes that by providing exceptional customer service that UGLC patrons will return to make use of the various services the university offers. Mr. Perez enjoys working on the professional development of the students' employees at the UGLC. He shares with his student employees his practical experience in using electrical engineering concepts and computer technologies to help in everyday real-world applications. Mr. Perez has worked with the UTeach program at UTEP since its creation to streamline the transition process for engineering students from local area high schools to college by equipping their teachers with teaching strategies and technologies each summer. Oscar enjoys teamwork, believes in education as a process for achieving life-long learning rather than as a purely academic pursuit. He currently works on maintaining, upgrading and designing new computer classroom systems. Mr. Perez is inspired because he enjoys working with people and technology in the same environment.



**Mr. Mariano Olmos, El Paso Community College**

MARIANO OLMOS Associate Professor El Paso Community College, Engineering Department

EDUCATION B.S. Electrical Engineering, University of Texas at El Paso, El Paso, TX 1988 M.S. Electrical Engineering, University of Texas at El Paso, El Paso, TX 1992 M.S. Mechanical Engineering, University of Texas at El Paso, El Paso, TX 1999

EMPLOYMENT AND PROFESSIONAL EXPERIENCE • Associate Professor, El Paso Community College 2007-present • Electronics/Mathematics Instructor, El Paso Academy 2003-2006 • Test Engineer, Lucent Technologies 2000-2002 • Mathematics Developmental Education Instructor, 1993-1999

SYNERGISTIC ACTIVITIES Boards: • Texas Higher Education Coordinating Board, Industrial Engineering Council member 2010-2013. • Member of Eta Kappa Nu, Electrical Engineering Honor Society. • TEXAS Community College Aerospace Scholars (CAS) point of contact 2011-2013.

Appointments and Awards: • District Wide Academic Coordinator, Engineering Department 2007 to present. • Member of American Society for Engineering Education (ASEE). • Member of the Institute of Electrical and Electronics Engineers (IEEE). • Academic mentor for The Society of Women Engineers (SWE).

Conferences: • Border Learning Conference, El Paso, TX 2009 • Southwest seminar for great teaching, Taos, NM 2010 • Border Learning Conference, Las Cruces, TX 2010 • Southwest seminar for great teaching, Albuquerque, NM 2011 • Southwest seminar for great teaching, Santa Fe, NM 2012 • Southwest seminar for great teaching, Santa Fe, NM 2013

CURRENT FIELDS OF INTEREST MATLAB GUI applications, Robotics, Programmable Logic Controllers, and gas engines.

SELECTED RECENT PUBLICATIONS IN EDUCATION Rafael S. Gutierrez, Sergio Flores, Fernando Tovia, Olga Valerio, Mariano Olmos. "Simulation Based Modeling of Warehousing Operations in Engineering Education Based on an Axiomatic Design." MAS 2011: The 10th International Conference on Modeling and Applied Simulation, September 12-15, 2011. Rome, Italy. (Collaborators representing the University of Texas at El Paso; Universidad Autonoma de Cd. Juarez; Philadelphia University; El Paso Community College)

RECENT COLLABORATORS Professor Rafael Gutierrez, UTEP; Professor Sergio Flores, UTEP; Arturo Bronson, UTEP; and Peter Golding, UTEP.

**Ms. Tonie Badillo, El Paso Community College**

Ms. Tonie Badillo is a Division Dean at the Valle Verde campus of El Paso Community College. She oversees art, architecture, math, science, and engineering. She is the administrative liaison for the Valle Verde Early College High School (VVECHS) and Clint ISD Early College Academy (CECA).

Prior to becoming a Division Dean, Ms. Badillo was the Early College High School Initiatives Coordinator at El Paso Community College. In that role, Tonie coordinated efforts among five early college high schools: Mission ECHS, Valle Verde ECHS, Northwest ECHS, Transmountain ECHS, and Cotton Valley ECHS. In addition, she was part of the Steering Committee for Clint ECHS which began operations in 2012. She worked closely with the Texas Education Agency Early College High School Office, the Texas High School Project now Educate Texas, the University of Texas at El Paso, and the eight school districts who are involved in early college programs.

From 2005 to 2010, Tonie served as Faculty Liaison for Mission ECHS, EPCC's first early college high school in partnership with the Socorro Independent School District. Tonie is an Associate Professor in English as a Second Language and was the discipline's faculty coordinator at the Mission del Paso campus from 2004 to 2011.

Tonie was a full-time instructor for the Americana Language Programs and a full-time instructor and coordinator for Workforce Development. She has been employed full-time by the College since 1999 and was tenured in 2008.



Born and raised in Mexico City, Tonie Badillo began her undergraduate education at the Escuela Nacional de Antropología e Historia but transferred to the University of Texas at El Paso during her sophomore year to earn a Bachelor's and a Master's Degree in Linguistics. She is also a certified translator.

In 2007, she received the Award for Dedication to Community College ESL Teaching by the Global Education Association TESOL. She has served on the board of Tierra Madre, an environmentally sound low-income housing community in the region, and was president of the Association of Women in the Community College. She is a member of the Early College High School Leadership Council and the administrative liaison for the Integrated Technologies Committee at EPCC.

## **Sharing Best Practices Toward Seamless Transfer of Engineering Students**

If the United States is to maintain its economic leadership and be able to sustain its share of high-technology jobs, it must prepare the next generation of professional engineers. It is widely agreed that innovation is the key and engineering is essential to this task; but engineering will only contribute to success if it is able to continue to adapt to new trends and provide education to the next generation of diverse students so as to arm them with the tools needed for the world as it will be, not as it is today.

As a contribution to preparing the next generation of professional engineers, the El Paso Community College (EPCC) and the University of Texas at El Paso (UTEP) have undertaken a major effort to support engineering student success. Students at EPCC and UTEP travel back-and-forward between the two institutions seamlessly, in what has effectively become an effective commuter model of engineering education. The commuter model is akin to taking an education-driven train, back-and-fro between stations, as needed, to achieve students engineering education goals, in a most effective and efficient way for each individual student.

This project, dubbed “Exito Sin Limites” (ESL), translated to (Success Without Borders”) has had very major impact on the success of our institutions, in achieving seamless transfer for engineering students. As such the ESL project has enabled EPCC and UTEP to fulfill their mutual institutional goals. The project will continue to yield impact during the next decade. This will be monitored through data analysis available and updated annually through the Center for Research in Engineering and Technology Education (CREaTE) in College of Engineering at UTEP in collaboration with the Center for Institutional Evaluation Research and Planning (CIERP) at UTEP.

The project has enabled articulation agreements to be established between the partners. Degree plan checklists, flowcharts, prerequisite tables, and transfer guides are in place for each degree program between EPCC and UTEP. See <http://engineering.utep.edu/plaza/circles/degree.htm>

The Department of Education provided major support for this partnership project. The goals of the project were exceeded in all key areas, and the results have been implemented and institutionalized. During the next five years we anticipate seeing growth in the transfer back and forward of our students due to the improvements and outstanding cooperation.

The project completed all of the original project goals: (1) Advancing collaboration between EPCC and the UTEP College of Engineering to support student success through cooperative advising, guidance and transfer programs, (2) Promoting student success in the engineering education pipeline through (3) Cooperative advising, curriculum development, and peer mentoring that (4) Supports increased enrolments, persistence and graduation rates through our joint process of (5) Achieving continuous quality improvement.

Working cooperatively, the El Paso Community College [EPCC] and The University of Texas at El Paso [UTEP] have achieved the goal of transforming engineering education student success. Together the institutions affirm to be a progressive leader in high quality, innovative,

engineering educational opportunities. Our cooperation provides a model for 2-year and 4-year institutions across the breadth of the USA that wish to support STEM success for underrepresented ethnic minorities, and especially minority women. As such, this best practices partnership between El Paso Community College (EPCC) and The University of Texas at El Paso (UTEP) is making a positive difference by supporting students' transfer and engineering degree attainment.



**Figure 2.** El Paso Community College President, Dr. Richard Rhoades, (now President of Austin Community College) and University of Texas at El Paso President, Dr. Diana Natalicio, at the ceremonial signing of the articulation agreements at UTEP in 2010. Looking on is UTEP engineering dean, Dr. Richard Schoephoerster.

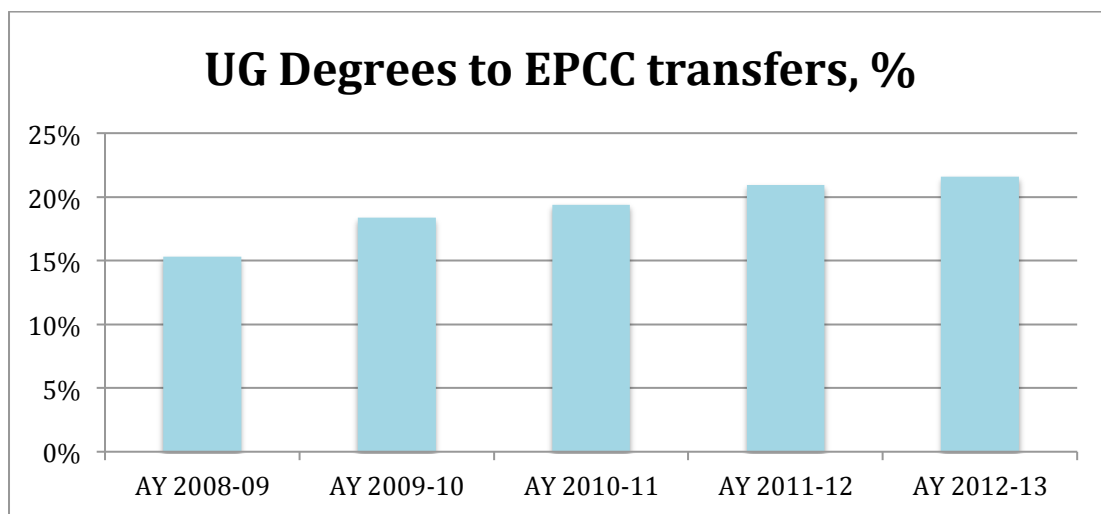
The El Paso region's students benefit as the result of a sustained partnership between the El Paso higher education institutions and their engineering programs. EPCC and UTEP have instituted common application, careful advising, comprehensive articulation of engineering degree plans, and common course instruction, methods and assessments. Students can readily transfer between the two- and four-year institutions. Students studying engineering transfer back-and-forward between institutions, supporting their retention and graduation.

The partnership began in 2007 when engineering program administrators established a taskforce on transfer (and reverse transfer), in a joint project titled "Exito Sin Limites" (Success Without Boundaries). The taskforce identified the major challenges facing our students. As one example, program advising did not include transfer support. As another example, degree alignment appeared haphazard, especially to students. Once the barriers to success were identified, the

partnering institutions proceeded to work together to introduce (for example), shared advising practices, and comprehensive articulation of engineering courses and degree programs.

### Comprehensive Articulation Agreements

Comprehensive articulation agreements were signed in 2009, and we now have 5 years of experience in instituting the partnership agreements. Students average 60-credit hours of transfer (3-credit hours per course) from EPCC to UTEP, and complete their degrees with an average of about 150-credit hours of course work (EPCC and UTEP). Degree requirements are typically 128-credit hours. The fraction of UTEP students graduating who commenced at EPCC has grown from 40 in AY 2008-09, out of 261 total UTEP engineering graduates (15-% of all UTEP graduates in engineering), to 66 in AY 2012-13, out of 306 total UTEP engineering graduates (22-% of all UTEP graduates in engineering).



**Figure 1.** Graduates from EPCC receiving undergraduate degrees in engineering at UTEP has been growing steadily since the Exito Sin Limites project commenced, leading to increased partnering between engineering communities at EPCC and UTEP.

### Engineering Student Curriculum Agreements Drive Alignment and Connectivity

The EPCC Engineering program and UTEP College of Engineering partners worked to establish articulation agreements. These agreements were developed to complement the overarching EPCC-UTEP Articulation Agreement (circa Feb 2009). There were seven (7) articulation agreements developed: (a) the foundation agreement between the UTEP College of Engineering and the EPCC Engineering Program, that established the principles and practices of collaboration on developing seamless engineering education for El Paso region students. This agreement supports student advancement and completion of EPCC and UTEP associate / engineering degrees, and (b) a specific articulation agreement with and between each UTEP Department of Engineering and the EPCC Engineering program.

## Cooperative Foundational Engineering Course Development

The cooperative development of engineering courses proceeded according to the overarching agreement established between the institutions, with then administrators Bobby Ortega, Dean of Engineering at EPCC, and Peter Golding, Associate Dean of Engineering at UTEP, providing leadership of the effort. The Director of Engineering at EPCC, Mariano Olmos, and the Program Director of Undergraduate Studies at the UTEP College of Engineering, Blanca Carrasco, coordinated the cooperative development process.

Engineering instructors from EPCC and UTEP advance the common use of course and educational curriculums and laboratory tools, and engineering software for use in introduction to engineering courses.

## Advising and Professional Student Development

EPCC and UTEP worked together to investigate common advising and student professional development initiatives. The goal of the investigation was to establish common course advising and professional development practices for EPCC and UTEP engineering students, which is supportive of transfer to and from EPCC and UTEP, and is focused on student success.

The possibility of appointing joint professional advising and student development specialists, who are dedicated to education of engineering students at both campuses, was included in the scope of work. This subsequently was made possible by the award of a Minority Science and Engineering Improvement Program (MSEIP) award provided by the Department of Education, and this award really advance the joint project advising aspect. EPCC used the funds provided through the MSEIP contract to appoint professional counsellors, and further advance teaching of engineering students.

In the next step of the project, these advisors were jointly appointed, spending on average approximately half of their professional appointment times at EPCC and the other half at UTEP. The advisors are able to move freely between the campuses, according to the varying advising schedules and events.

## Producing a National Model for Engineering Education Transfer

Having been ranked for the past six years as one of the top five graduate engineering schools in the nation for Hispanics by Hispanic Business magazine, The University of Texas at El Paso is widely known for developing outstanding engineers. Through this landmark agreement EPCC and UTEP have effectively created a national model for partnership between a 2-year and 4-year institution in engineering education.

The articulation agreement between the two institutions will ensure that future Miner engineers can make a seamless transition between EPCC and UTEP, making the path to a degree more accessible. See: <http://engineering.utep.edu/news102710b.htm>



The success of the partnership has won the Texas Higher Education Coordinating Board STAR award for transfer partnerships. The EPCC-UTEP partnership was recognized as a best practice and regularly used as a model in establishing engineering articulation agreements between 2- and 4-year institutions across the state of Texas. The latter is not instituted, following a successful “Tuning Texas” project completed as part of a Lumina Foundation enterprise to enhance transfer between two- and four-year institutions. Future pathways being contemplated in the EPCC-UTEP partnership include introducing a new undergraduate engineering leadership degree, the first of its kind in the nation, and teaching of engineering in early college high schools in the El Paso region, to foster STEM pathways and provide college credit prior to graduation from high school.



**Figure 3.** The transfer project received the STEP Award for Best Practices in External Collaborations between 2- and 4-Year Institutions from the Texas Higher Education Coordinating Board (THECB).

The Exito Sin Limites (ESL) project was undertaken to enable a 2- and 4-year institution to work together in providing matching opportunities for students; who can now transfer seamlessly between the El Paso Community College (EPCC) and the University of Texas at El Paso (UTEP) in science and engineering education. This has increased retention and graduation of underrepresented ethnic minorities, particularly women, in scientific and technological careers to over 22-% of all engineering graduates in engineering at UTEP, beyond the original project goal of 15-%.

At the completion of their program students can earn both an Associate of Science degree from EPCC and a Bachelor of Science in their chosen engineering discipline (civil, computer science, electrical and computer, industrial, mechanical, and metallurgical and materials engineering) from UTEP.