



The Case of an Electrical and Computer Engineering (ECE) Department in the Internationalization Process of a Research I Public Institution

Dr. Fabiola P Ehlers-Zavala, Colorado State University

Fabiola P. Ehlers-Zavala was named INTO Colorado State University (CSU)'s Center Director in November 2014, having previously fulfilled the role of INTO CSU Academic Director (March 2013-November 2014). In her CD capacity, she works with Colleges across campus, and has a particular interest in the preparation of international students pursuing engineering degrees at the undergraduate and graduate levels. She earned her B.A. in English Language and Literature together with her teaching certificate from the Pontificia Universidad Católica de Valparaíso in 1992. She then pursued graduate education in the U.S., and she earned both her M.A. (1994) in English and Ph.D. in English Studies (1999) from Illinois State University. Upon her graduation, she worked for Illinois State University (ISU) as Assistant Professor in Bilingual/Bicultural Education until she received her tenure and promotion to Associate Professor. While at ISU, in her last year, she directed the Bilingual/Bicultural Education Program in the College of Education. In 2006, she moved to Colorado to teach in the M.A. in English at Colorado State University where she received her second tenure and promotion to Associate Professor in 2009. Between 2009 and 2013, she directed the M.A. in English (TESL/TEFL). Her areas of expertise include: second language/bilingual reading, second language assessment, and ESL/bilingual teacher preparation. She is the coauthor of *Reading Strategies for Spanish Speakers*. Her publications in books and journals include "Meeting the reading comprehension challenges of diverse English language learners in K-12: Key contributions from reading research" (2016), "Advocacy in Language Teaching" (2013), "History of Bilingual Special Education" (2011), "Bilingualism and Education: Educating At-Risk Learners" (2010), "How Can Teachers Help Adolescent English Language Learners Attain Academic Literacy?" (2009), "Teaching Adolescent English Language Learners" (2008), "Assessing English Language Learners (ELLs) in Mainstream Classrooms" in *The Reading Teacher* (2006 & reprinted in 2010); "Bilingual Reading from a Dual Coding Perspective" (2005) in *Proceedings of the 4th International Symposium on Bilingualism*; "Preparing Quality Bilingual/Bicultural Teachers in the 21st Century: A PDS Model for Educational Change and Success" (2004), "Use of Lexical Borrowings in Sonoran Border Spanish" (2003). She serves on the editorial board of *The International Multilingual Research Journal (IMRJ)* and *TESOL Journal*. She is Past President of Illinois TESOL/Bilingual Education, Past Chair TESOL International Bilingual Education Interest Section and Past Chair of TESOL International's Nominating Committee. Most recently, Dr. Ehlers-Zavala served as a member of the International TESOL Diversity and Inclusion Committee (2014-2015), and has been invited to serve in the Editorial Review Board for *The Reading Teacher (RT)* Volume 70 review year (2015-2016).

Dr. Anthony A. Maciejewski, Colorado State University

Anthony A. Maciejewski received the BSEE, MS, and PhD degrees from the Ohio State University in 1982, 1984, and 1987, respectively. From 1988 to 2001, he was a professor of electrical and computer engineering at Purdue University, West Lafayette. He is currently a professor and the department head of Electrical and Computer Engineering at Colorado State University. He is a fellow of the IEEE. A complete vita is available at: <http://www.engr.colostate.edu/~aam>.

The Case of an Electrical and Computer Engineering (ECE) Department in the Internationalization Process of a Research I Public Institution

Colleges of Engineering at US tier I public institutions have had a long-standing tradition of welcoming international students to their various programs, especially at the graduate level. Recently, the percentage of international students studying at the undergraduate level has also been increasing. Out of all the engineering disciplines, this is perhaps most frequently true for Electrical and Computer Engineering (ECE) programs. Despite the relative decline in US students interested in studying ECE as compared to other engineering disciplines, ECE programs remain highly attractive to international students who wish to come to the US to pursue the best education possible and acquire the knowledge and skills to meet their career and professional goals. Unfortunately, ECE departments, as is the case for the one we will describe in this paper, often find themselves having to turn away many highly qualified candidates because they are confronted with issues of capacity, so admission to highly ranked ECE programs remains extremely competitive in the US.

The changing landscape of higher education in the US is presenting ECE programs with a new challenge, which is the welcoming of a different type of student who is oftentimes perceived as less deserving of access to the highly competitive programs universities offer. We are referring to a group of students known as Pathway (PW) students. PW students are international students who fall short of meeting direct admission requirements when it comes to both GPA and performance in English language proficiency tests for admission to a university. These students enroll in PW programs that offer greater support, and provide them the opportunity to succeed in such a competitive environment. These PW programs are relatively new in the US and are often the direct result of new efforts at some universities to develop comprehensive plans for campus internationalization. Such efforts may be facilitated by the formation of public / private partnerships or Joint Ventures (JVs) between the university and a private company. These new partnerships constitute new creative ways that some universities have found to diversify their campus communities and gain a global perspective. A growing number of universities in the US have been embracing these non-traditional models for rapidly internationalizing their university campuses. It has become evident that the internationalization of university campuses is no longer just a matter of signing memoranda of understanding to facilitate student mobility through the traditional college year abroad experience.³ In this paper, we describe the specific case of Colorado State University (CSU) and the response of its ECE department to this new development.

The Case of Colorado State University. In the spring of 2012, CSU took an audacious step when it signed a 30-year agreement with INTO University Partnerships (IUP) to form a JV that would become known as INTO CSU. INTO CSU is a limited liability corporation that serves as the new English language center for the university and is equally owned by CSU and INTO IUP. Though run by a Center Director for day-to-day operations, it is ultimately governed by the INTO CSU Board, comprised of three CSU members from Central Administration and three senior officials from INTO. Their shared goals are (1) to increase international student enrollment; (2) to tap into yet another group that can contribute to expand those numbers (i.e., Pathway students); (3) to provide international experiences to the domestic students as well as

the university staff, academics, and administrators, who may not be able to go abroad; (4) to serve those coming from abroad with the goal of pursuing an education in the US, given the high value placed on American higher education; (5) to internationalize the campus community at large; and (6) to enrich the off-campus community that will also benefit from welcoming greater linguistic and cultural diversity. Through the formation of this partnership, CSU found a new way to emerge from an era of limited resources and remain competitive at a time when the globalization of higher education programs in the US has become crucial to the preparation of university graduates who need to function in a highly interconnected world and demonstrate they have developed the social and professional skills to function in highly diverse and dynamic environments.

With the advent of INTO CSU, PW programs were developed very quickly at the undergraduate and graduate levels for a Fall 2012 implementation. Initially, among the repertoire of programs, the College of Engineering created multiple PW programs. At the undergraduate level, a two-semester (Standard) PW in Engineering was developed (see Figure 1); and at the graduate level, several PWs were created in Masters of Engineering (ME) degree programs for the following areas: Civil Engineering, Chemical Engineering, Electrical and Computer Engineering (see Figure 2), and Mechanical Engineering. The ME programs were created because these are coursework-only programs that do not overly burden faculty, i.e., they do not have to take on more graduate advisees. It is important to underscore that the development of these PWs occurred very quickly, and it was in the hands of the CSU Academic Working Group that had been formed and tasked with the development of these PWs. The members of this group were varied, representing key areas of the CSU operation: undergraduate and graduate affairs, advising, student affairs, international programs, and so forth. They did not necessarily involve the faculty in the specific departments, which resulted in some considerable backlash as described in the next section using ECE as a case in point.

The case of ECE at CSU. Because the formation of INTO CSU happened so quickly and the development of PWs did not always involve the key administrators and faculty that directly run the degree programs, there was much initial resistance to the new proposition. Unfortunately, many faculty erroneously perceived this effort as being pursued by CSU's Central Administration purely to cope with financial constraints due to rapidly shrinking financial support from the state. The lack of an effective communication plan to articulate the core goals of this new initiative was probably the result of underestimating the level of resistance that would become evident shortly after the inception of INTO CSU. Unfortunately, this initial sentiment continued to exist in varying degrees among many departments at CSU for several years. In the following paragraphs, we describe the journey of ECE in this new context.

The ECE journey relative to INTO CSU. In analyzing and reflecting back on the journey of the ECE department since INTO CSU came to be, it is possible to identify the following four stages:

- 1) Resistance
- 2) Awakening
- 3) Collaboration
- 4) Innovation

Figure 1. Sample Standard PW for Engineering—Undergraduate

Engineering						
Standard Pathway - 2 Semesters	Degree Program Components				Program Information	
Fall: August 15, 2016 Spring: January 9, 2017	125-159 credit hour degree programs 18-22 credit hours apply from Pathway ^{1,2} 103-141 credits remaining toward degree ¹					
Entry Requirements <ul style="list-style-type: none"> High school diploma with 2.5 GPA Language requirements: <ul style="list-style-type: none"> TOEFL IBT 60 OR IELTS 5.5 (5.5 minimum subscores in reading and writing) OR PTEA 44 OR Password 6 OR completion of the Academic English Level 3 with a minimum 75% in all graded courses <p>All students should take the online proctored version of the CSU Mathematics Placement Examination (MPE) before arrival.</p>	Semester 1	Course Title	Prerequisites	Credit Hours	Progression Requirements <ul style="list-style-type: none"> Cumulative CSU GPA of 3.0 B or better in MATH 160 or 161 B or better in PH 141 or CHEM 111 C or better in CHEM 112 No grade lower than a C in all Pathway classes, including those in mathematics, science and engineering No I or U grades; no unresolved W grade in a required Pathway course; no S grades, except in cases of credit earned by exam Submit a Pathway progression application Notes <ol style="list-style-type: none"> Total credits remaining toward degree depend on specific engineering program of study. CHEM 111/112 may not apply toward graduation in some engineering programs. Prerequisites are (a) earned transferable Calculus credit, (b) MPE results with MATH 160 placement or (c) MATH 117, 118, 124, 125, 126. Students not starting in MATH 160 may not be able to complete the Pathway program in two semesters. If students are eligible to complete the second semester of their Pathway during the summer, this course is not required during the Summer semester. Students who begin in the Spring semester and plan to finish during the Summer semester will take fewer than the stated number of credit hours for semester two. <p>These courses are generally delivered through the INTO CSU Center and are for Pathway students only.</p>	
	EAP 150	English for International Students I		6		
	SPCM 100	Introduction to Popular Culture		3		
	MATH 160 ^{3,4}	Calculus for Physical Scientists I	See notes 3 and 4	1-5		
	ENGR 102	Engineering Problem Solving		3		
	Total					13-17
		Semester 2	Course Title	Prerequisites		Credit Hours
		EAP 151	English for International Students II			3
			AUCC General Education Course ⁵			3
		MATH 161	Calculus for Physical Scientists II	MATH 160		4
	CHEM 111 ²	General Chemistry I AND	MPE or MATH 118	4		
	CHEM 112 ²	General Chemistry Laboratory I OR	CHEM 111 or concurrent registration	1		
	PH 141	Physics for Scientists and Engineers	MATH 160 or concurrent registration	5		
Total				15		

Figure 2. Sample Graduate PW in ECE (old version 2012-2015)

ME in Electrical and Computer Engineering

www.engr.colostate.edu/ece

STANDARD PATHWAY - TWO SEMESTERS	DEGREE PROGRAM COMPONENTS			PROGRAM INFORMATION	
START DATE <ul style="list-style-type: none"> August 17, 2015 January 11, 2016 	<ul style="list-style-type: none"> 30 credit hour degree program 6-12 credit hours may apply from Pathway 18-24 credit hours remaining toward degree In addition to graduate credits earned from the ECE 5xx courses, up to six credits of the ECE 4xx courses will apply toward the degree 				
ENTRY REQUIREMENTS <ul style="list-style-type: none"> Undergraduate degree in Electrical Engineering, Computer Engineering, Computer Science, or closely related discipline Minimum 2.75 cumulative undergraduate GPA in math, sciences, and technical courses Language requirements: TOEFL IBT 71 or IELTS 6.0 or completion of the Academic English Program with minimum 80% in all graded courses 	SEMESTER 1	COURSE TITLE	CREDIT HOURS	PROGRESSION REQUIREMENTS <ul style="list-style-type: none"> Minimum 3.0 CSU GPA GRE score of 146 Verbal, 153 Quantitative, 3.0+ Analytical Writing No grade lower than a B in all Electrical and Computer Engineering courses No grade lower than a B in any EAP class No grade lower than a B in any graduate-level class No I or U grades; no unresolved W grade in a required Pathway course; no S grades, except in cases of credit earned by exam 3 recommendation letters from Electrical and Computer Engineering faculty Current résumé and cover letter NOTES <p>GRE preparation is provided through INTO CSU as part of the program.</p> <ol style="list-style-type: none"> Students are advised to choose ECE courses that maximize their own career development. No more than 6 credits of ECE 4xx will count toward the 30 credit hours required for the Master of Engineering degree. Excluded courses: ECE 401, 402, 495. <p>These courses are generally delivered through the INTO CSU Center and are for Pathway students only.</p>	
	EAP 150	English for International Students I	6		
	ECE 4xx or 5xx ^{2,3}	ECE Elective	3		
	ECE 4xx or 5xx ^{2,3}	ECE Elective	3		
	TOTAL				12
		SEMESTER 2	COURSE TITLE		CREDIT HOURS
	EAP 152	English for International Graduate Students	6		
	ECE 4xx or 5xx ^{2,3}	ECE Elective	3		
	ECE 4xx or 5xx ^{2,3}	ECE Elective	3		
	TOTAL				12

The stage of resistance. As it should have been predicted, in any organization (big or small) when there is rapid change for which people have not been properly prepared to adopt and / or embrace, there is inevitably resistance to change. The ECE department at CSU was no exception. The introduction of INTO CSU happened too quickly and was very much perceived as an imposition on a department that already had a history of extremely healthy international enrollment, e.g., 80% of ECE's graduate population is not from the US. For this reason, both its head and its faculty failed to understand why they had to be part of the new initiative on which they had not been properly consulted. Given the fact that the value proposition of INTO CSU had not been properly introduced, it is fair to say that the ECE department found itself practically coerced into actively participating in the comprehensive internationalization process of CSU, as it had unfolded very much as a top-down imperative. Initially, ECE reacted negatively to the creation of INTO CSU, and its required participation. Therefore, there was little desire to collaborate with INTO CSU, and the communication between ECE and INTO CSU was difficult, affecting the possibility to engage in meaningful curricular improvements to the PW program. In time, and coinciding with a transition in the INTO CSU leadership, it became evident that there was clearly a lack of understanding as to the ultimate goals of INTO CSU relative to the comprehensive internationalization plan of CSU, and the important role that ECE had in this process. Pathway programs had not been properly explained to the Department, and it had become evident that there were many myths and misconceptions about INTO CSU.

In other words, due to the fact that the ECE participation in the pathway program had been the result of a top-down decision, the leadership, faculty and staff were not prepared for this new development. Consequently, this situation resulted in much push back and resistance during the initial years of INTO CSU. The primary concerns outlined by the ECE leadership that contributed to the push back was their initial perception that this PW program involved: (1) a "back door" admission for less qualified international students; (2) the "bumping" of students that were directly admissible in favor of the admission of students who could potentially bring down the quality of the education being delivered by ECE faculty; (3) the immediate capacity concerns that emerged in light of fewer resources being re-directed to the department by Central administration; and (4) a possible re-direction of university resources to attend to the needs of, what was perceived to be, a "privileged" group of students who could afford this type of very costly education, as is the case of most pathway programs. Thus, in light of all these identified issues, ECE resisted this change, and was reluctant to cooperate for at least the first three years of the INTO CSU partnership. This resistance to change was not surprising, but natural, as the formation of the partnership had taken place very quickly and had not been properly rolled out to the university community. Needless to say, the concerns of ECE were to a significant extent representative of the concerns of the larger university community.

The stage of awakening. As it happens in most cases, resistance to change and to the unknown is a natural human response. Through education and effective leadership, however, challenges of this sort can be overcome, as it also became the case for ECE. This is exactly what ECE has begun to experience in the fourth year of the INTO CSU partnership. Through improvements in communication between ECE and INTO CSU, this fourth year has constituted the renaissance of the ECE pathway. What had been practically impossible to accomplish in the first three years was finally overcome, as ECE began to experience an attitudinal shift towards the whole

pathway concept. Through much education and active involvement, the ECE leadership began to understand that this INTO CSU initiative was intended to: (a) assist with a larger institutional goal of CSU, which was the internationalization of its campus at a much faster rate; (b) not just assist a privileged few who could afford this education, but also those who would need greater financial support, as a scholarship program had been established resulting from the matriculation success of pathway students in their corresponding degree programs; (c) critically examine the educational experience of English learners in engineering programs to ensure their success; and (d) promote cross-departmental collaboration between units that contribute different expertise to solve interdisciplinary research problems, e.g., English for specific academic purposes, second language acquisition. In other words, the ECE leadership realized that this could be a way to truly begin to learn on how to best prepare future engineers for a global world.

There were probably two main initiatives that significantly contributed to the shifting of negative attitudes and a move in a positive direction together with the start of building trust across the units. The first one was an agreement reached by the College Dean, the ECE Department Head, and the new INTO CSU Center Director. This agreement was intended to jointly fund an academic advisor position that would be housed in ECE and who would contribute to serve pathway students and all other students in the department. This individual would also liaise with the main academic advisor for pathway students at INTO CSU to ensure the smooth transition of the student into the degree program. The second one was the invitation on the part of INTO CSU to the ECE head to engage in expanding transnational collaborative efforts with outstanding institutions in regions where international collaboration was less developed, as was the case of Latin America. After all, INTO CSU was also intended to contribute to the larger internationalization goals of the university, and through INTO CSU resources could be leveraged to address areas of the world where ECE could engage in new collaborative initiatives. INTO CSU was able to demonstrate the potential it had to contribute to expand the international recruitment capacity of CSU and, in this specific case, that of ECE.

The stage of collaboration. Now that some of the initial skepticism on the part of ECE was overcome, the department head began to productively engage with INTO CSU in the substantial revision of the pathway programs. Such work is certainly evidenced in the example offered in Figure 3, as compared to Figure 2. For a variety of reasons, the initial ECE pathway curriculum had not been made explicit or overtly articulated for the prospective applicant, which resulted in a lower quality experience for the pathway student. The lack of an explicit curriculum posited academic advising challenges and logistical challenges when trying to (a) register pathway students for ECE courses that may or may not relate to the students' direct academic and professional goals and interests, and (b) secure academic support for those students at risk of possible failure, especially at the graduate level.

A step further is the fact that in moving forward, ECE has contributed 9 different plans of study for students interested in the ME program. This action has allowed INTO CSU to be in a better position to provide academic advising to new students and assist them with course registration. It also has allowed us to address administrative pieces that relate to preparing to welcome students who have expressed an interest in a particular plan of study so that capacity issues can be more promptly addressed.

Figure 3. Sample of revised / new graduate PW in ECE.

NEW: ME in Electrical and Computer Engineering - Robotics: Vision																																			
Standard Pathway - 2 Semesters Fall: August 15, 2016 Spring: January 9, 2017 ¹	Degree Program Components 30 credit hour degree program 13 credit hours may apply from Pathway 17 credit hours remaining toward degree In addition to graduate credits earned from the ECE 5xx courses, up to six credits of the ECE 4xx courses will apply toward the degree.		Program Information																																
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Finally, and currently unfolding, is the recruitment of other CSU specialists in teaching English learners from the English department who are conducting a needs analysis in ECE courses. The sole purpose is to develop an understanding of the expectations in both undergraduate and graduate engineering education. Results from this work are intended to inform the existing English for Academic Purposes courses in the PW program that are intended to help English learners develop high levels of English proficiency in contexts, such as ECE, where they need to develop and/or acquire English for specific academic purposes.

The stage of innovation. Fortunately, ECE is now beginning to envision the true potential of this partnership. ECE is finding that, by engaging in this cross-departmental effort, ECE has the potential to emerge as an innovator rather than a follower when it comes to the education of future engineers for global citizenship. Future engineers have much to benefit from a campus university internationalization plan. It is the result of these efforts that will allow future engineers to develop the core competencies to effectively function in a global world. These include: the development of an intercultural competence, world mindedness,^{4,5} and so forth.

The stage of innovation has also been further nurtured by the collaborative interdisciplinary work that is unfolding between the expertise at INTO CSU and that of Engineering. For example, given that the INTO CSU Center Director is an applied linguist with specialization in the teaching and learning of English to speakers of other languages, she invited the Department Head of ECE to collaborate in a study that intended to better understand the non-verbal processes involved in the process of reading comprehension of engineering texts. Such research was presented at the Annual Meeting of the American Association of Applied Linguistics in April 2016.² As these two experts engaged in this type of work, they are closely monitoring student performance to better understand what possible interventions need to be considered in the teaching and learning of PW students relative to the competencies needed for becoming successful ECE students and eventually graduates.

Here are some additional tangible ways in which the partnership has begun to influence the ECE department that can lead to true educational innovation:

- Cross-disciplinary collaboration
- Faculty development
- Curricular re-envisioning
- Resource sharing through collaborative practices
- Research and scholarship
- Departmental competitiveness and global positioning

There is no question that the INTO CSU venture offers a platform for innovation. It represents a new educational challenge, and it has the potential to serve as the springboard that ECE faculty can make use of to have a greater reach of significant impact not only on campus but on the world. “Successful CI [comprehensive internationalization] is not the product of well-meaning but heavy top-down decision-making by presidents and provosts. Neither is it only the result of bottom-up populism, but a product of these two processes in concert to pursue consensus” (Hudzik, 2011, p. 3).

Recommendations / Lessons learned.

The success of INTO CSU, and in particular of its signature program known as “Pathways” will require a long-term shared commitment by departments working in collaboration with the language specialists at INTO CSU. It will require clarity regarding the shared goals relative to what it takes to ensure student success and a true and positive attitude that will lead to collaboration, innovation and continuous education of everyone on campus and beyond.

Based on our shared experiences, we have concluded that the following are essential ingredients for success: (1) clear and effective communication of the value proposition; (2) involvement of key personnel directly affected by the initiative (i.e., administrators, faculty, and staff); (3) strong and effective leadership; (4) clear plans for addressing the issues of concern, such as capacity and student performance; (5) strong willingness to work to plan for growth; (6) high levels of commitment to, and a strong sense of belief in, the joint venture.

Finally, based on our direct experience, we can only agree with the following: “Comprehensive internationalization is a commitment, confirmed through action, to infuse international and comparative perspectives throughout the teaching, research, and service missions of higher education. It shapes institutional ethos and values and touches the entire higher education enterprise. It is essential that it be embraced by institutional leadership, governance, faculty, students, and all academic service and support units. It is an institutional imperative, not just a desirable possibility. Comprehensive internationalization not only impacts all of campus life but the institution’s external frames of reference, partnerships, and relations. The global reconfiguration of economies, systems of trade, research, and communication, and the impact of global forces on local life, dramatically expand the need for comprehensive internationalization and the motivations and purposes driving it”.¹ True commitment is key for success.

References

- [1] Hudzik, J.K. (2011). Comprehensive Internationalization: From concept to action. *NAFSA Executive Summary*, pp. 1-2, doi: http://www.nafsa.org/_/File/_/cizn2011_execsummary.pdf
- [2] Ehlers-Zavala, F. & Maciejewski, A. (2016). *Mental imagery experienced by both pathway and non-pathway graduate students in an engineering course at a US Research I institution*. Poster presentation discussed at the annual meeting of the American Association for Applied Linguistics (AAAL), Orlando, FL.
- [3] Marmolejo, F. (2011). The future of higher education internationalization. *The Chronicle of Higher Education*. doi: <http://chronicle.com/blogs/worldwise/defining-internationalization/28615>
- [4] Parsons, R. L. (2010). The effects of an internationalized university experience on domestic students in the United States and Australia, *Journal of Studies in International Education*, 14(4), 313-334.
- [5] Volet, S. (2003). Challenges of internationalization: Enhancing intercultural competence and skills for critical reflection on the situated and non-neutral nature of knowledge. In *2003 Biennial Language and Academic Skills in Higher Education Conference*, 24 - 25 November 2003, Student learning Centre, Flinders University, Adelaide, 1-10.