
AC 2012-4429: STUDENT SUCCESS INITIATIVES FOR UNDERGRADUATE INTERNATIONAL ENGINEERING STUDENTS

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Jean Landa Pytel is the Assistant Dean for Student Services for the College of Engineering at the Pennsylvania State University and Associate Professor of engineering science and mechanics. In her role as Assistant Dean, she manages student-related issues for more than 8,000 undergraduates. She is involved with efforts to internationalize engineering curricula and engineering students and to provide programs and support systems to help international engineering students to succeed. She is the current Chair of the International Division of ASEE and Past-chair of the Pennsylvania State University Faculty Senate.

Student Success Initiatives for International Undergraduate Engineering Students

With the recent trends of increasing international student enrollments in colleges of engineering within the United States, a new emphasis has been placed on the transition, retention, and graduation of this population. Student success programs and policies aimed at increasing or improving retention and graduation rates of engineering programs can typically be categorized into three areas: curricular, extra-curricular, and faculty/staff. Within each of these categories, programs can be found that target the success of international undergraduate engineering students. This paper will review the recent trends of international student enrollments and graduation, highlight challenges facing this population, and provide promising practices in each of the areas of curriculum, extra-curricular opportunities, and faculty/staff support and development.

Enrollment and Graduation Trends

In many places around the world, attaining a degree from an institution of higher education in the United States (U.S.) is seen as the pinnacle of academic achievement. Several factors contribute to this reputation, such as availability and flexibility of options at U.S. universities, the quality of education offered, and the overall perceived value of a Western education. This has resulted in an influx of international students at American universities. International enrollments at American colleges and universities have increased significantly in recent years, with engineering programs seeing the bulk of the increases. While enrollments from all areas of the globe have increased, the largest growth has been in students from China. The number of Chinese undergraduates studying in America has grown nearly 30% in the last year, with large increases in enrollment from other countries in Southeast Asia, India, and the Middle East¹. Table 1 is a summary of two large public universities in the CIC (Committee on Institutional Cooperation) showing the change in number of students by country for the past 4 years. Over the last five years, several universities across the Midwest have seen close to a 500% increase in first-year international students. Additionally, while the universities as a whole maintain about a 10% international population, and engineering programs are averaging a 6.7% international population, enrollments in colleges of engineering can be as high as 25% of the population, creating a strong sub-culture in the student body^{2,3}. Figure 1 shows the recent trends of overall numbers and percentages of beginning first-year international students for the past 4 years of two large enrollment engineering schools in the Big 10. This graph demonstrates the increases being seen at most institutions from moderate (School 2) to large (School 1) increases.

Table 1. Enrollment Trends by Country

	2008		2009		2010		2011	
	School 1	School 2	School 1	School 2	School 1	School 2	School 1	School 2
India	72	12	69	23	75	30	78	37
China	22	22	65	46	78	76	161	49
South Korea	29	12	19	17	29	12	20	21
Malaysia	23		9		13		11	
UAE	1		2	13	1	25	19	22
Others	50	79	79	90	69	83	132	94
Total International Students	197	125	243	189	265	226	421	223

Although enrollments have escalated in recent years, graduation rates of international students in engineering are not following the same trend. Figure 2 is a look at the graduation rates of one large Midwestern school. The combination of increasing enrollments with decreasing graduation rates creates an environment where assuming international students can graduate with little to no attention is no longer feasible.

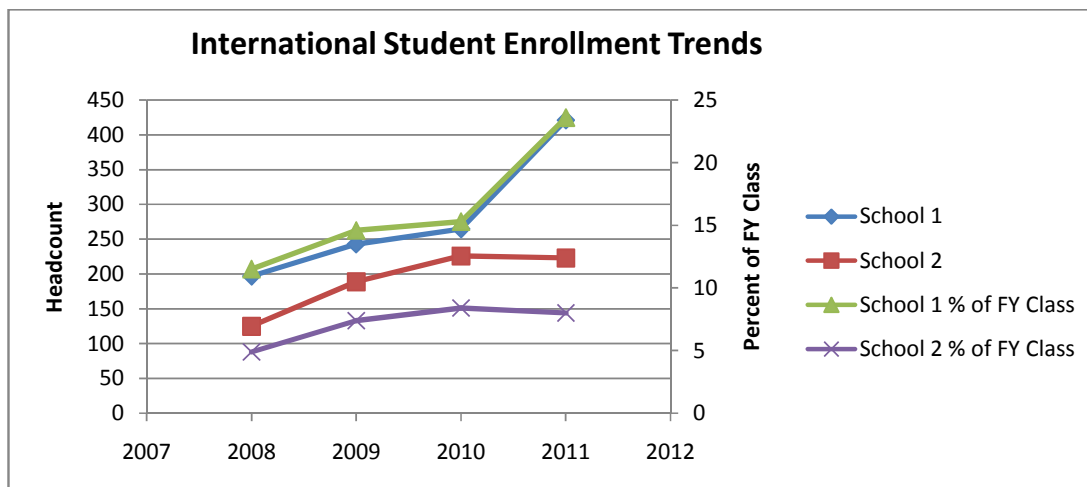


Figure 1. Enrollment Trends

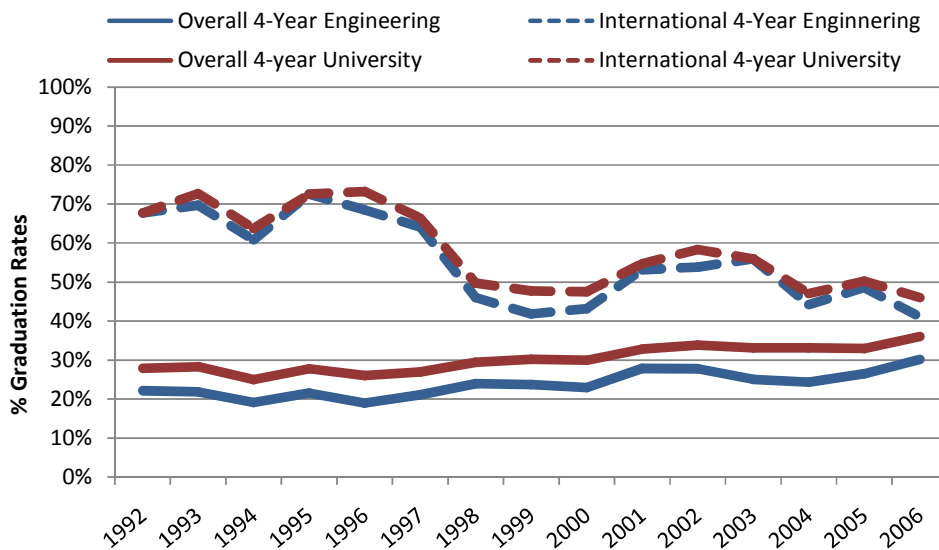


Figure 2. Comparison of 4-year engineering and university graduation rates of domestic students and international students.

However, by the 6-year, the gap between domestic and international is closing with international students remaining more successful. It is interesting to note that if an international student leaves engineering, they tend to leave the university as is demonstrated by the small differences between the dashed lines associated with the international student graduation rates between engineering and university in both Figures 2 and 3. In comparison, the solid lines represent domestic student graduation rates are approximately 20% different between engineering and university rates showing domestic students do stay at the university after leaving engineering.

Challenges Facing International Students in the U.S.

International students who come to the U.S. to earn an engineering degree are facing unprecedented challenges due to current worldwide political, economic and security issues. The challenges include sufficient English proficiency for engineering courses that now require increasingly significant speaking, writing, and teamwork communication components. Additionally, there are perceptions of isolation, the natural tendency to stick with others from their home country, making meaningful connections with American students and instructors, adjusting to many cultural differences, distance from home as well as from personal support structures. Getting visas in a timely manner can also be costly and for some, increasingly difficult; and may affect arrival time with respect to the beginning of classes. In addition, international students have less academic flexibility and face more stringent academic performance constraints to maintain their visa status, as well as limits on their major. That is particularly challenging for students at institutions that use GPA to determine the admissibility of a student to a major that has an enrollment limit or cap. Last, but certainly not least, experiential

learning opportunities, such as co-ops and internship experiences, are very limited to persons not holding US citizenship. Such challenges need to be recognized so that students may prepare appropriately and institutions can develop appropriate orientation and mitigation programs.

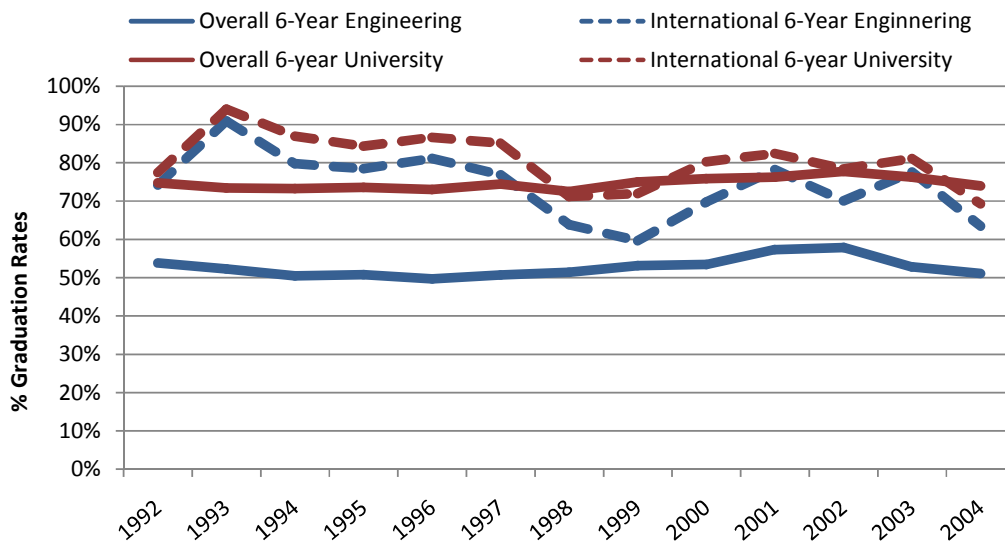


Figure 3. Comparison of 6-year engineering and university graduation rates of domestic students and international students

Promising Practices - Curricular

In the area of curricular student success, there are policies and programs targeting the time of enrollment of students in their courses such that the international students are not the last to enroll and therefore experiencing limited course availability. In the stage between admission and acceptance of admission to enrollment and actual arrival on campus, common communication mechanisms have now shifted to social networking such as Facebook™. However, not all of our entering students have access to this social media. To overcome a portion of this, and due to the increasing numbers of students from China, one institution has created a Renren™ site (<http://www.renren.com> - "Renren" in Chinese is equivalent to "everyone" in English) for those entering students. This page created by a U.S. institution of higher education and more specifically College of Engineering is the first known of its kind. The site and page are used to communicate important entrance information, allow students to ask staff and other students questions, and allow early connections to both staff and entering fellow students. Not only are course schedules found to be shared on the site, so are living arrangements, arrival times, and hobbies. This type of early engagement makes the summer enrollment process move smoother and increases comfort for the entering students. We have found that our Facebook pages and Renren pages are continued to be used by the entering class as they progress through their studies as communication and networking tools. For example, help and study sessions are advertised on

the site, special student organization events are posted, and advising questions are asked and answered. We have staff and students that monitor each of these sites to maintain the integrity of information and to make sure it is being used appropriately. Figure 4 is a screenshot of the Renren site.



Figure 4. Screenshot of Renren Engineering Site of Purdue University

In addition, working with offices of international scholars or students is a key element to understand when and how individual students will be arriving on campus. Access to tools, such as systems that track visas, allow for proactive planning. This is especially the case as you anticipate student arrival and course needs.

Within-course policies such as placement of students in first-year teams, can be a benefit to student success. Our international students, even in some of the increasing numbers, are still under-represented in the engineering classroom. Therefore, carefully placing team members can be important to their success and comfort level. There can be language issues when doing this, if for example two international students speaking the same language are placed together. They may have a tendency to speak in their native or common (since a majority of international students speak more than 2 languages) language and thus potentially excluding their team members who do not understand that particular language. Immersion in the English language (or any language for that matter) can be a difficult transition and these situations must be openly discussed often in those first courses in higher education. These situations are often indications of transition struggles or a general lack of understanding and therefore are a teachable moment

for proper teaming techniques such as doing checks for understanding on a consistent and regular basis.

English courses specifically designed for English-Second-Language students can help to overcome that transition to immersion experience. However, capacity of these course offerings are being seen as a current problem in some programs. Finally, curricula targeting a competency level of intercultural sensitivity, or further what we refer to as cultural humility, for all students and faculty can have a positive impact on students in general but international student success in particular. Use of information such as that provided by Greet Hofstede^{4,5} in work studying cultural comparisons published based on company culture in the workforce. With the understanding that the initial work was done in the workplace and several decades ago, application to of these understandings can impact the engineering classroom through teaming and design. In addition, broad generalizations do not always apply to individuals and should be used cautiously but these continuums open a conversation related to international student experiences that might not otherwise occur. For example, Hofstede's Power Distance Index is an indication of the accepted level of power or hierarchy that can be related to teams and team structures and roles. In addition, this same continuum can have an impact on the design process in that highly hierarchical or high power distance cultures such as Asia can find ill-structured problems where questioning authority or going beyond the instructions of authority can be seen as disrespectful yet to US culture this is not only encouraged, but expected. Professional development using these types of frameworks as discussions can lead to higher levels of faculty understanding.

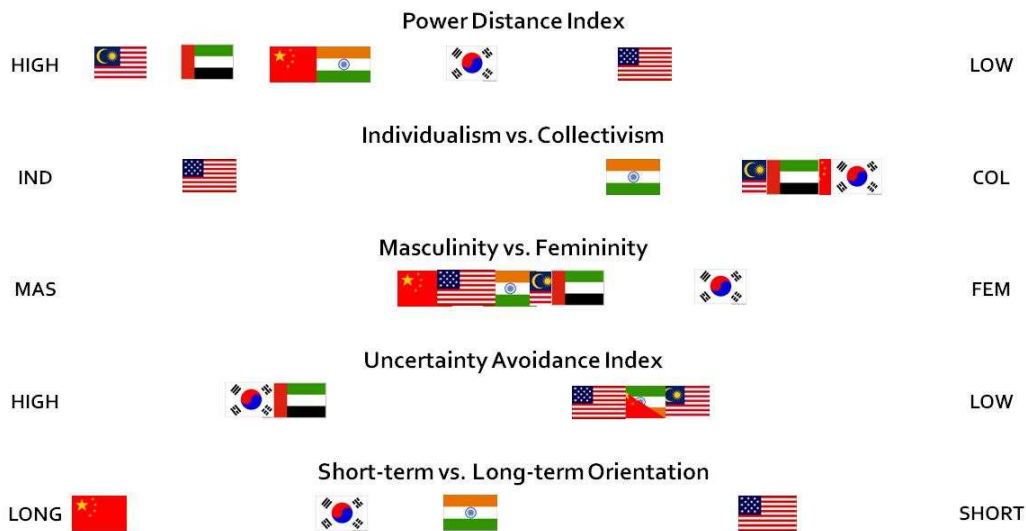


Figure 5. Hofstede's (1980) National Cultural Dimensions for the top 5 countries in enrolling in engineering at Purdue University for fall 2011.

Promising Practices - Extra-curricular

Extra-curricular initiatives such as professional student organizations supporting international student populations, e.g., Chinese Engineering Student Council, housing initiatives, transition to college experiences, and student activities open houses where international students gain knowledge of opportunities outside of the classroom are all important. Learning communities targeting the learning and/or the living experience are additional support mechanisms. These learning communities can be a win-win for both domestic and international students and recognizes the fact that some U.S. students may not have been nor may they be going abroad in the future (less than 3% of U.S. engineering students study abroad during their bachelor's years). These communities provide an international exposure to students who may not have considered a true international experience abroad. Finally, efforts by support staff and faculty can be key. Some institutions are now creating staff positions specific to international experience academic advising within engineering. These positions are discipline specific while complimenting campus-wide international student services programs. Finally, faculty professional development programs are expanding initiatives for faculty to take international student experiences into account when considering course pedagogy.

Future Work

This paper is meant to highlight the need for a bigger conversation concerning our international student populations in U.S. institutions of higher education in general, but more specifically in our engineering programs. As our international student population increases in U.S. engineering schools, additional emphasis will need to be placed on understanding this particular student population. These mechanisms must work to overcome specific challenges to this group of students. History shows us that they are successful students in engineering programs, but there is a trend of decreasing retention and graduation rates that must be studied and arrested. There are many promising practices in curricular, extra-curricular and faculty/staff initiatives that can be shared and adapted to multiple institutions.

References

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