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Engineering Students in a Global World: Lehigh University's Global Citizenship Program

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Engineering Students in a Global World: Lehigh University's Global Citizenship Program

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Engineering Students in a Global World: Lehigh University's Global Citizenship Program

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ABSTRACT

As the world grows smaller and companies become increasingly international, engineering students with a global education will be in high demand. Given the constraints of the typical undergraduate engineering curriculum, it can be extremely challenging for engineering students to participate in activities designed to promote global awareness. Lehigh University's answer to this challenge is the Global Citizenship Program (GCP), a "backpack" program designed to be accessible to any student on campus. The "backpack" metaphor means that all students should be able to assemble their own particular mix of additional courses and experiences in order to develop a global perspective that deepens their core disciplinary training. The GCP at Lehigh provides focus and structure to engineering students, providing opportunities for study abroad and organizing their humanities and social science electives into a coherent package of curricular and co-curricular experiences that maximizes the educational potential of these few non-engineering opportunities.

Introduction

Joining Lehigh's Global Citizenship Program has been one of the best decisions I have made. It has taught me the importance of thinking in a global way: accepting and learning about other cultures. As a future engineer, I think it will not only help me prepare for the future as a more knowledgeable and complete professional, but also make me a more understanding and better person. I have made lots of friends from the program, and also had unforgettable new experiences with the group abroad (Intersession Trip to Hong Kong). Ecuador is my home country; I think I have portrayed, in a certain way, my culture. Because I have contributed different views and perspectives, this experience has been enriched for every one of us in the program.

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The Lehigh University's Global Citizenship Program (GCP) starts with the notion that every student will live in a diverse, global, interconnected world. Whether as engineers, business travelers, consumers of international services, or simply owners of computers, no student today can avoid the world outside of the U.S. borders. Lehigh's GCP is a "backpack" program; it is not a new major or minor, but rather a program designed to be accessible to any student in any of the three undergraduate colleges (arts and sciences, business, or engineering) on campus. In today's global reality, it no longer makes sense for education in global awareness and competence to reside in a few disciplinary silos; students should not have to choose between a traditional major in which valuable technical skills are taught or a program that provides the tools for understanding the globalizing forces shaping our world. The "backpack" metaphor means that all students should be able to assemble their own particular mix of additional courses and experiences in order to develop a global perspective that deepens their core disciplinary training.

The backpack design is particularly important for engineering students. In some senses, engineers always have been "international," given the nature of the problems to be solved and the realities of large, corporate life. Yet engineering students traditionally have not been able to add the requirements of an international credential (for example, language, culture, politics, religion, or international economics) to their already constrained curriculum. One explicit purpose of Lehigh's GCP was to design a program that could fit inside the relatively small backpack available to undergraduate engineering students.

Global Citizenship Program (GCP) Overview

Because the GCP is not a new major or minor, but rather an interdisciplinary certificate program, its administrative structure is lean, consisting of a faculty director with a course release each semester plus a full time professional, exempt staff member. The lean administrative structure requires creative partnerships with offices across campus – including the Registrar, Study Abroad, Deans and Provost, Admissions, and

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Student Life. The necessity of collaborating widely to create structures and processes that really work for students, faculty and staff is one key to the success and rapid rise of visibility of the program – made possible, initially, by visible support for the program from the University President as well as the Mellon Foundation.

Because costs associated with the GCP are partially subsidized by the university, first year classes are limited to 30 students. Incoming first year students are invited to apply during the summer before their matriculation. The application includes two short essays asking students to reflect on an important global issue and their own definition of a "global citizen." Students must also submit two additional references attesting to their community engagement during their high school careers. The admission committee (comprised of program leaders as well as representatives from Admissions, GCP student committees, and selected representatives from the three undergraduate colleges) looks for students who can display a real commitment to working with others - either in school activities, sports, their communities, or other organizations such as the Boy or Girl Scouts. The program is not an academic honors program, nor does it look for students who are considered "leaders;" rather, the program seeks students who have demonstrated a willingness to work in real ways toward common goals with others.

The (co)curricular design of Lehigh's GCP rests on the assumption that rather than emphasizing job skill creation, students' "backpack" should include courses and experiences that aid them in developing the critical skills necessary for an informed citizenry. In other words, the design assumes that Lehigh global citizens, particularly engineers whose programs are accredited by ABET, acquire key skills in their disciplinary majors in which their departmental faculty continually revise their curricula. Particularly because Lehigh's engineering college has engaged in significant strategic planning and curricular innovation in recent years, the original "backpack" metaphor was grounded in the confidence that engineering students' majors provide the specific skills and analytical tools for negotiating both their career choices and their abilities to access and use technologies. As workers, moreover, graduates likely will receive additional job training for their integration into the global economy. The GCP, instead, focuses students' attention on their responsibilities as economic, political and social actors in a globalized world.

The greatest challenge of the backpack metaphor is that engineering students' curricula allow very little

flexibility. Similar to other engineering programs, Lehigh University engineering undergraduates have as few as 16 elective credits in their four year careers. Yet, if the goal of the program is for students to develop a "stance in the world," then students need to get out *into* the world. It is not the same to know something about another country from a third source – books, the internet, film, or music (although these can be invaluable resources) – as it is to *engage* in another culture, both experiencing viscerally the difference as well as thinking deliberately about one's reaction to the difference [1,2].

The first key element of Lehigh's GCP is a 12-14 day trip during the intersession between the fall and spring semesters of students' first year. Lehigh University faculty lead these trips, and the schedule is designed to "get students' boots dirty" by experiencing the human face of globalization through site visits, service projects, cultural interchanges and other non-classroom learning. Students selected for the GCP pay only \$500 toward the cost of the trip, and the university subsidizes the remainder. The trip locations typically are chosen in order to engage existing Lehigh faculty expertise, in part to build support for the program across campus. For example, to date, Lehigh faculty from a variety of departments with substantial research and/or professional networks in non-US locations have led trips to Santiago, Chile; Hong Kong; Prague; Shanghai; and Capetown, South Africa. Because the trip occurs in the intersession between the fall and spring semesters, faculty are not removed from their normal, departmental teaching loads. During the fall, the faculty trip leader leads a weekly one-hour, one credit orientation to the country destination as an overload and receives \$4000 at the completion of the intersession trip. Faculty who lead GCP intersession trips count their additional teaching, as well as trip design and leadership, as part of their annual professional accountability for the purposes of salary review. It remains unclear at this date the degree to which trip leadership will help or harm faculty in tenure and promotion review, but the campus climate is generally supportive of participation in the GCP. The intersession trips are administered through the GCP in very close collaboration with the campus Study Abroad Office in order to maximize consistency in administrative details such as insurance, liability, and academic policy across the range of Lehigh-approved study abroad programs. In designing each intersession trip, the GCP works with faculty trip leaders to emphasize experiential learning rather than traditional lectures, and each trip addresses a wide range of global issues, including, for example, economic success and poverty/social dislocation, growth and unintended

consequences such as environmental degradation, and technological advance and cultural resistance.

Another key breakthrough in successfully designing a workable “backpack” is what has become known as “double-dipping” – or redesigning courses that students already must take. At Lehigh, all first year students must take English I and II unless they enter with Advanced Placement credit. First year GCP students, instead, enroll in a specially-designed English I class, taught by professors in the Modern Languages and Literatures department, called “Globalization and Cultures.” This course meets all of the writing requirements of English I (pages, revisions, consultation with the professor), but it does so by introducing students to substantive political, economic, social, and cultural debates in contemporary globalization. After the intersession trip, in which students see firsthand many of the issues raised in the first semester course, students return to a redesigned English II class in the spring semester. This course is taught by an English instructor who also participated in the intersession trip with the GCP students, and all of the writing assignments are based on their shared trip experiences. The sum of the first year trip, bracketed by writing intensive courses designed to raise critical issues and force written reflection, is a rich first year experience that does not remove any electives from an engineering student’s future course load. In addition to English I and II, the faculty from several other widely-enrolled classes such as Business I and Economics I (both taken by most engineering students) have participated in the GCP faculty development seminar and substantially revised their syllabi in order to crosslist with the GCP.

A third innovation is an additional required study abroad experience in a non-English speaking country, in which the student must take the language of the host country. Students are encouraged to find challenging programs that suit their individual intellectual and career interests – either Lehigh faculty-led programs or programs offered through third-party providers. The GCP and Study Abroad Office work together closely to help students research and apply to programs that complement their own individualized “backpacks.” While students are encouraged to find programs in countries in which they might already have some language training, previous language proficiency is not a requirement. For some students, the required language study in the host country will result in a deepening of previous language skill; for others, studying a language as beginners will result in an increased sensitivity to the identity of “the other” (i.e., the minority) and an enhanced ability to experience the host culture. Liberal arts and business students, with more flexibility in their curricula, are strongly

encouraged to study abroad for at least a semester, if not a full year. Engineering students, while they can participate in a handful of semester programs approved by the Lehigh engineering faculty, typically can study abroad only in the summer. One of the most interesting results of students’ first year intersession trip is that GCP students, both engineers and non-engineers, tend to choose far less traditional study abroad programs than their typical Lehigh counterparts. They choose destinations farther afield in programs offering more hands-on, project-based experiences – quite possibly because the first year trip gave them the confidence necessary to envision themselves in more exciting and challenging locations. All students, regardless of language proficiency, face the prospect of struggling with being the “other” in a language not their own.

After the writing-intensive and experiential first year, GCP students are expected to turn their attentions to their work in their chosen majors and programs. As well as an additional study abroad, students must enroll in 3 classes that are crosslisted with GCP. This requirement points to another innovation at the heart of the program’s success. Each spring semester, the GCP offers a faculty development seminar that meets weekly for two hours. Faculty are paid a modest stipend for revising an existing course or creating a new course that can be crosslisted with the GCP. The faculty development seminar not only provides a forum for interdisciplinary faculty discussion regarding the myriad ways that globalization affects traditional academic disciplines, but also provides a forum for course and curriculum innovation in light of the Global Citizenship mission. After three seminars, the GCP boasts over 50 new or revised courses across all three undergraduate colleges, serving all Lehigh undergraduates.

Widespread faculty engagement extends the culture of global citizenship beyond new, crosslisted courses. Engaged faculty are more likely to (a) lead trips abroad, (b) incorporate additional international experiential components into on-campus courses, and (c) design ways for returned study abroad students (GCP and non-GCP) to incorporate their experience/learning from abroad into on-campus courses. For engineering faculty, the GCP faculty development seminar offers one of the few opportunities to work collaboratively with faculty from other colleges, particularly from the liberal arts college. For engineering students, the faculty development seminar encourages professors to explicitly incorporate their international perspectives and experiences into the traditional curriculum.

The final, critical component of the GCP is an emphasis on co-curricular learning. In designing the GCP

program, the idea was to simply encourage students to take fuller advantage of the many opportunities provided on a major university campus; therefore, students are required to participate in at least two major co-curricular events each semester – for example, major guest speaker series, trips to the United Nations with Lehigh’s Global Union (an umbrella organization over a range of international student associations), symposia such as a Microfinance Symposium organized through Lehigh’s Martindale Center, the annual International Bazaar, and the like.

This emphasis on co-curricular engagement has taken a more interesting turn under student leadership. GCP students take very seriously the charge to develop their sense of responsibility in the world, starting at Lehigh. There is a strong, shared esprit de corps around their goal to help internationalize the campus. GCP students organized into student committees to develop their own stamp on the campus, and examples of their leadership include a GCP newsletter and global blog available to all students, a presentation at the International Bazaar spotlighting individuals’ definition of global citizenship from across campus, a potential service project abroad over Spring Break, an exhibit entitled “Global Citizenship: Here and There” in collaboration with ArtsLehigh, and leadership in The Movement (a student-led organization that is dedicated to increasing diversity on campus). In addition, GCP students are leaders in a wide range of student organizations related to global themes – the World Affairs Club, Students for Sustainable Development, Socially Responsible Investment Club, and the Phi Beta Delta International Honors Society.

Perhaps the most dramatic example of the GCP students’ goal to make a difference at Lehigh is the Global Citizenship House. While on the intersession trip to Shanghai in 2006, first year GCP students lamented that their only housing choice for the next year, other than a Greek organization, was to cast their lot into the general pool, meaning that they would have no control over where, or with whom, they might live. When they returned to campus in January, the first year students wrote a letter to then-President Gregory Farrington asking for a Global Citizenship (GC) House with co-curricular programming. By the spring, the GC House became only the second special-interest housing on campus (after the Umoja House) with the theme “Global Citizenship through Local Initiative.” The students in the GC House also organized into student committees, with one committee dedicated to organizing a series of informal dinners with local leaders throughout the Lehigh Valley, particularly among the Latino community. After a flurry of op-ed

pieces in the campus newspaper regarding the desirability of special interest housing, it is expected that other student groups will begin pressing the administration to open new opportunities for students. The GCP has set a very high standard, and the Student Life staff uses it as the model for other groups who wish to secure special interest housing.

Engineers as Global Citizens

Historically, careers in engineering often have included an international component, and most engineering faculty who have lived and worked internationally would consider themselves to be global citizens. A room full of engineering faculty at Lehigh University would include scholars originally from China, India, United Kingdom, Switzerland, Romania, Hungary, and Turkey as well as people from across the United States. These faculty work in an international atmosphere with graduate students from around the world and professional collaborators from far flung locations. Many of their projects treat processes and products that encourage and enhance globalization, and others affect how humans live and work in a rapidly changing contemporary global environment. For example, Lehigh’s optical technology researchers are helping to create communication technology for the 21st century; the Energy Research Center at Lehigh is engaged in clean coal technology and efficiencies in steam-electric generation; civil engineers are working on earthquake resistant buildings, monitoring techniques for basic infrastructure, and remediation of contaminated water and soils; and computer science faculty lead research projects on mobile robotics, data mining, and security issues.

In spite of their international and cosmopolitan frame of reference, however, engineering faculty traditionally have had difficulty imparting their perspective to students. The technically-focused curriculum for training undergraduate engineers limits the degree to which faculty global perspective and values trickle-down to undergraduate education. Faculty take very seriously their responsibility to provide rigorous and comprehensive training, and keeping up with advances in their fields creates constant pressure to fit more and more technical content into students’ courses. As a result, undergraduate students generally keep their noses to the grindstone as they negotiate the intense requirements of their degree programs.

Some undergraduates have a vague vision about working internationally when they complete their degrees, and they sometimes fulfill their humanities/social science requirements with courses in

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modern languages, international relations, comparative religion, area studies, or other subjects that have an international perspective. However, for engineering students, the opportunities for such global studies are minimal; at Lehigh University, a typical engineering degree program requires 132 credits, 16 of which are designated for humanities/social science electives. Most advisors simply tell students to use those 16 credits to take something they “enjoy” or to gain more “credentials.” And yet, the importance of providing undergraduates with an educational experience that includes an international perspective has never been greater. According to NAFSA [3], global learning, particularly in nontraditional locations outside of the United Kingdom and the rest of western Europe, is central to U.S. security and economic interests. But, without a careful advising system that deliberately guides students into choosing a coherent set of courses to build an international perspective, most students only accidentally find their way to appropriate courses.

Similarly, engineering students, who typically focus on acquiring job skills and credentials, rarely think about their futures as contributing citizens in their communities, nation, or the world. In spite of the global perspective and social commitments of many engineering faculty, course syllabi rarely provide structured opportunities for students to think about their future responsibilities as men and women in the world. The GCP at Lehigh provides focus and structure to engineering students who often arrive at the university with poorly formed notions of how and where they might make contributions to society. Although some engineering students find a way to tutor science or mathematics in local schools or to help install and teach about computers to shrink the digital gap, most of these activities are organized through the university community service office or through off-campus non-profit organizations and not through the college of engineering. The GCP backpack principle organizes engineering students’ electives into a coherent package of curricular and co-curricular experiences that maximizes the educational potential of these few non-engineering opportunities.

Moreover, students in the GCP begin building their backpack from their first semester of college. Traditionally, few advisors of first or second year students take the time to get to know their advisees. Yet, it is early in the educational process when good advising can have the most affect. By junior or senior year, when an advisor might be learning about the aspirations and dreams of an advisee, it is often too late to incorporate courses that would promote a deeper understanding in an area such as globalization in the rigid undergraduate engineering curriculum.

Study abroad is another method of helping engineering students to widen their vision of the world and themselves. According to Connell [4, p. 35], “[t]o have that sense that you can navigate and perform in a new environment is an incredible affirming experience for one’s identity.” A very high percentage of graduating high school students aspire to study abroad, yet engineering students often lose their enthusiasm for study abroad as they confront the rigor of the curriculum or their advisor tells them that it might be hard to graduate in four years if they study abroad [5]. One unintended benefit of the additional study abroad requirement for GCP engineering students is that it forces their faculty advisors to learn about the various winter term and summer programs available abroad. These non-semester programs can provide many elements of a longer semester abroad program and do not interrupt the flow of the rigid prerequisite system in engineering programs. Engineering students are encouraged to find summer and/or winter study abroad opportunities that fit around their semester curricula and that enable them to use their technical skills in hands-on, project-based programs. Moreover, the faculty directors of these non-semester programs are uniformly pleased with the addition of engineering undergraduates, who are usually bright and hardworking and bring a fresh perspective to their programs.

Beyond the GCP curriculum, engineering students in the GCP have helped to initiate co-curricular activities that support their goals to gain technical skills, learn about other peoples and cultures, challenge the comfort zone by immersion in new situations, and do good things for people. Two examples of these co-curricular activities at Lehigh are particularly noteworthy for engineering students. The first, a new chapter of Engineers Without Borders (EWB)-USA, is part of a student-initiated club called Students for Sustainable Development (SSD). The club was founded in 2005 with the help of one of the co-authors (Jellison) who included funding for this activity in her proposal for an NSF Career Award. Several of the student leaders in this new club/chapter are part of the first cohort of GCP students. Since the GCP students are dedicated to spreading the message and goals of the program on campus, the existence of EWB-USA and SSD shows at least one success. A second curricular/co-curricular activity at Lehigh University involves an important poverty reduction strategy called micro-finance (MF). A Lehigh University research center, the Martindale Center for Private Enterprise, has been a proponent in bringing both scholars and practitioners of MF to campus for workshops and seminars. The GCP students have embraced MF and have participated in the workshops and seminars in large numbers. The

workshops and seminars have given way to formal courses as well.

The two activities mentioned above (EWB-USA and MF) came together in the summer of 2006 in Honduras. Both groups traveled to a rural Honduran village, Pueblo Nuevo, where a Lehigh faculty member runs a summer archaeology program. Eight EWB-USA students spent two weeks conducting an assessment of the village water supply system, which has both quantity and quality problems. Eight MF students spent two weeks doing two activities: (i) they followed a few MF companies and their field representatives as they went to various villages to make collections and to give out micro-loans and (ii) they looked for ways to reduce transaction costs by introducing appropriate technologies. The sixteen EWB-USA and MF students met over dinner to discuss the day's activities and compare notes. There was also time for the EWB-USA and MF students to learn about the region's history by visiting the dig being worked by the archaeology students. In addition, the students interacted every day with local people. Although most of the students in these two programs are not members of the GCP, the GCP students in both groups provided a sensitivity to local culture, customs and behavior that was beneficial to all students on the trip.

Sustainable engineering solutions, the ultimate goal of engineering professionals, cannot be developed without consideration of the cultural, political, and economic climate in which they will be implemented. The cross-disciplinary, regionally-focused model of global learning exemplified in Honduras and promoted at Lehigh University provides a more rich and engaging study abroad experience than could be obtained by study abroad with a single disciplinary group. Lehigh engineering students are exposed not only to another culture, but also to international components of other academic disciplines with which they will have to interact as future professionals.

Assessment Challenges: Are We Accomplishing Our Goals?

Currently, 80 Lehigh students are officially participating in the GCP, of which 14 are enrolled in the P.C. Rossin College of Engineering. The first cohort graduates in 2008, and the challenge is to devise solid assessment tools in order to gather evidence to shape future program adjustment and planning. The first question – driven by students' own concerns – is relatively straightforward; engineering students (and sometimes their faculty) typically worry that by

participating in the GCP they will not be as equally prepared and technically skilled as their engineering peers who focus more exclusively on building expertise in their fields. The GCP's first assessment goal regarding its success with engineering students is to measure if GCP alumni are equally skilled as their non-GCP counterparts in the technical requirements of their majors, using routine measures such as students' GPA at graduation, acceptance into graduate programs (where appropriate), job attainment, and the like.

The GCP's intention to transform engineering undergraduates into global citizens is a far more complicated assessment challenge requiring a multi-method approach and a clear understanding of the components of a true "global citizen." Yet, to date, in spite of the explosion of such programs nationwide, there is no common definition of "global citizenship," nor a shared set of educational outcomes or assessment tools [6]. According to Deardorff [7, p. 26], "if key goals of international education are advancing international understanding and graduating 'global citizens,' developing appropriate and effective assessment measures is vital." While it is possible to operationalize some of the hallmarks of a global citizen (for example, foreign language proficiency, knowledge of other cultures, even habits such as reading non-U.S. news sources), measuring a student's evolving definition of his/her citizenship is both highly subjective and easily contested [8]. Indeed, "global citizenship" is a term used with increasing frequency to denote a wide range of educational and philosophical aims. Views range from the broad idea that everyone as a member of the human race can be a global citizen to a narrow, legal argument that "citizens" can only exist in relation to a nationality that has physical, territorial boundaries [6]. Yet, clearly the term means something to those who employ it, and the ambiguity of the term is appealing to faculty who want to challenge students to think seriously about historically complex notions of identity, moral/ethical responsibility, rights and obligations. Oxfam, for example, defines the term with a particularly broad conceptual sweep: "a global citizen demonstrates an individual awareness and sense of his/her role in the world; respect and value for diversity; understanding how the world works economically, politically, socially, culturally, technologically, and environmentally; outrage at injustices; participation and contribution to the community at the local and global level; willingness to act to make the world a more sustainable place; and responsibility for taking personal action" [9]. In 1999, the American Association of Colleges and Universities (AAC&U) defined a global citizen as a citizen of the world experienced "in the ways of diverse cultures"

through which “own frames of identity and belief [can be bracketed] enough to be comfortable with multiple perspectives [and] to suspend disbelief in the presence of new cultures and new ways of seeing” [10]. The April 2002 AAC&U global citizenship initiative further defined the term as a “sophisticated understanding of the increasingly interconnected but unequal world, still plagued by violent conflicts, economic deprivation, and brutal inequalities at home and abroad.” As these examples show, the most fundamental assessment challenge for Lehigh University’s GCP is the lack of a nationally accepted definition of the term “global citizenship” or a set of standards that guide the implementation of such a program.

For now, while the national educational community converges on a shared set of assessment tools for global citizenship, we believe that we have anecdotal evidence regarding the subset of engineering GCP students that allows us to develop several concrete measures of success. Specifically, the GCP appears to affect undergraduate engineering students in at least three important (and somewhat unanticipated) ways.

Although it was not an explicit goal in the original design, the GCP *appears* to help retain students, particularly female students, in engineering. Although we have not yet gathered sufficient assessment data, anecdotal evidence suggests that the GCP’s focus on hands-on engagement in cross-disciplinary teams, beginning in students’ first year, helps students develop a sense of self and recognize, early on, the impact that their profession can have on their local and/or global communities. Several engineering students - particularly females - have commented informally that the GCP has given them a sense of cross-disciplinary community that provides both intellectual and social support early in their college careers, giving them the confidence to continue their engineering studies. Moreover, these same students say that they appreciate the ability to see, as early as their first year trip, concrete examples of how they can contribute to society as engineering professionals. We suspect that linking engineering academic training to a more explicit vision of the range of ways to *be* an engineer in the world may be of particular relevance to retaining young women in the profession, in addition to the positive educational effects for all students. By offering a variety of activities like the intersession trip abroad, multidisciplinary courses specifically targeting issues facing global citizenship development, activities like EWB-USA or MF, and by interacting with a wide range of local and global professionals, engineering GCP students receive a broader perspective than their other engineering counterparts. Students are introduced early in their college careers to how their specific area of engineering study can impact the greater global good. Participation

in the GCP shows students how to be socially active engineers in the world.

Devising a reliable measure of the GCP’s role in producing, and retaining, socially-conscious undergraduate male and female undergraduate engineers includes the challenge of controlling for the possibility that more socially-conscious high school students self-select as applicants to the program. Separating the effect of K-12 required community service programs (that are increasingly popular in school districts across the country) from individual students’ own sense of local/global engagement prior to entering the program may be difficult. Similarly, reliable measures would include a control group in order to determine the impact of the GCP versus the possible similar effects of other student activities such as affiliation with a sports team, music, theater, sorority or fraternity.

Another apparent impact on GCP students, including engineering students, stems from the social aspect of the program. Lehigh’s GCP students participate in the program within a cohort model, consisting of no more than 30 students per group. This network of students, representing each of the three colleges, provides both a support system and social peer group that links each student with a common intellectual interest in local and global issues, no matter what their individual area of study. In other words, students develop a social network of friends interested in similar issues but from different perspectives. Whitt et al. [11] showed that students whose social networks overlap significantly with their intellectual communities (meaning that they have friends who share their interests) tend to be both happier and more academically successful than students whose time is divided between their social outlets and their intellectual pursuits. Participation in the GCP creates a bridge between the two. And, as a result, GCP students appear to be inspired to seek a wider diversity of courses and co-curricular experiences, giving them greater confidence to challenge their professors and peer groups. Testing this idea also requires controlling for self-selection bias that could skew any apparent correlation.

We also believe that, similar to graduates of global programs at Universities of Rhode Island and Michigan, Lehigh’s engineering global citizens will represent the pool of students most sought after by employers. Although we do not yet have data, we expect that the attributes of a global citizen – technical skill combined with global awareness, foreign experience, and self-exploration – will translate into a more self-confident job applicant and a more facile employee. A longitudinal study would allow us to compare engineering global citizens’ short and long-

term employment success relative to their counterparts. Perhaps more importantly, such a study could measure the effect on long-term employment success of participating in the GCP versus other educational activities such as developing deeper language proficiency or disciplinary expertise. Ultimately, we expect that as the world grows smaller and companies become increasingly international, engineering students with a global education will be in very high demand.

Conclusion

Lehigh University's Global Citizenship Program rests on the belief that the university can transform its engineering students into future generations of global citizens. The program is structured around integrating academic coursework, co-curricular requirements, and international experiences. By creating a clear and deliberate path for students to deepen their understanding of their world and to translate that knowledge into action, Lehigh's GCP "backpack" allows undergraduate engineers to work within the constraints of their rigid curricula while finding relevance for their technical training in the real world. [12]

Challenges for the future of the GCP include (i) designing and implementing a senior capstone experience that integrates engineers' technical training with the goals of global citizenship, (ii) developing additional ways to maintain the bond between student cohorts in their sophomore through senior years, and (iii) fundraising to make additional study abroad affordable for less privileged students. After the success of the first year experience, it can be a challenge to find ways to maintain the program's intensity for students as they disperse into their majors, minors and other college activities - particularly for engineering students whose workload can lead to isolation from students in other curricula. It will be important to continue to forge new partnerships across campus to offer more cross-disciplinary opportunities to bring engineering and non-engineering students together to work on real world problems.

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