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 CHAPTER 5

In Search of Something More: My Path Towards International Service-Learning in Engineering Education

Margaret F. Pinnell

SUMMARY

My personal and professional travels led me toward global education, in particular the University of Dayton (UD) program Engineers in Technical Humanitarian Opportunities for Service-Learning (ETHOS). I do not believe I ever intended to become part of an international engineering education program. In fact, I think the international piece was just a bonus. What really drew me to the ETHOS program was what initially draws our students to the program – a desire to “help” people. In order for the reader to understand how I ended up being involved in global education through the ETHOS program, I must first explain where I came from, my rather unusual career path and the Marianist Spirit that is UD. The reason for this is that my upbringing makes my later involvement in an international program somewhat ironic. My very early experiences as a practicing engineer guided me towards the path of engineering education in the first place and, in particular, my approach towards engineering education. My somewhat unusual career path had a huge impact on what I value as an engineer and educator and my willingness to take career risks as an untenured professor at UD. These career risks came in the form of breaking many of the unwritten (and sometimes even clearly stated) rules associated with the pursuit of an academic career. Most importantly, however, the unique culture at UD provided me with the passion, opportunity and support to not only grow the ETHOS program but to also grow with the ETHOS program.

INTERNATIONAL ROOTS - HOMETOWN PULL

I was born and raised in Youngstown, Ohio. Like so many people from Youngstown, all four of my great grandparents came to the United States from a foreign country as young adults to work in the steel mills. Because of its roots, Youngstown was and continues to be, richly ethnic, benefitting from
its Italian, Slovak, Polish, Swedish, and Irish roots. However, once families settled in Youngstown they typically did not leave or even travel very far. It was quite common for large extended families, like mine, to live within a few miles of each other. There was no real reason for anybody to leave Youngstown. Families were close by and the community offered just about whatever a person might need. As a result, most people from Youngstown stayed close to home, attended the local university or trade school then worked and raised their families there. So, even though I enjoyed a variety of authentic international foods and traditions growing up, the idea of international travel was not on my radar.

**AN UNUSUAL PATH TO AN ACADEMIC CAREER**

As mentioned above, I had a slightly unusual career path that included what many may consider, “risky career choices.” These career risks included receiving all three degrees from the same university and then teaching at that university, taking time off to be a stay at home mom, and becoming very much involved in service-learning as an untenured professor. Since I never would have gotten involved in the ETHOS program had I not taken these career risks, I feel the need to go into a bit more detail.

**CAREER RISK 1 - ALL THREE DEGREES FROM THE SAME UNIVERSITY**

I am the product of my own, Catholic, Marianist university. I teach at the same university, the University of Dayton (UD), where I received all three of my degrees. Getting three degrees from one university or, even more unusual, pursuing a career at the university from which you received all your degrees is something that is certainly not recommended and is, in fact, prohibited at some universities. In my own defense, however, I never really planned on earning all three degrees from the same university. It was never really my intention, in fact, to pursue an academic career.

I ended up being an engineer by default. For as long as I can remember I wanted to be a large animal veterinarian. This career path stemmed largely from my love of animals, in general, and my love of horses, in particular. Unfortunately, however, my dream of becoming a horse vet was crushed when I passed out three times in three days while volunteering at a vet clinic when I was in the ninth grade. Realizing that I did not have the stomach to be a vet, I was forced to consider alternative career paths. At that time, I was sure that I did not want to be a teacher like my Mom or a carpenter like my Dad. Furthermore, having grown up relatively “poor,” I wanted a career that would provide me with some financial security. Like many students who end up in engineering, I was good in math and science. Because of this, my Mom suggested that I go into engineering. Although I really had no idea what engineering was all about, I decided to heed my Mom’s advice because her advice was always good.

The first degree I received from UD, a Bachelors in Mechanical Engineering (BME), was the product of choice. My guidance counselor informed me of UD’s great reputation for undergraduate engineering education. Even though UD was a little far from home (250 miles), it was far more affordable than some of the other universities I considered. UD’s affiliation with the Catholic Church also appealed to me. I grew up with a great deal of faith but very little religion. By this, I mean that
my family instilled a great love for God and sound foundation of Catholic values, but we rarely went to church. This changed when I was sixteen and able to drive myself to church. I started attending our local Catholic Church on a regular basis. I believed that going to a Catholic university like UD would enable me to learn more about my faith and also enable me to be more actively engaged in the Church.

The biggest selling point of UD, however, was the “feel” of the university community. When I stepped foot onto UD’s campus for a visit, I was immediately captivated by its friendly atmosphere and great sense of community. I felt at home. This uniquely warm, welcoming and nurturing atmosphere is something that is very difficult to put into words, but something that so many people who have visited UD have experienced and have also tried to express. Although not helpful to those who have never experienced it, I believe that this atmosphere may best be described as the “Marianist Spirit.” The best I can do to define this Marianist Spirit is to list the five characteristics of a Marianist Education which include: (1) educate for formation in faith, (2) provide an integral quality education, (3) educate in the family spirit, (4) educate for service, justice and peace, and (5) educate for adaptation and change.1 Powerfully charismatic, this Marianist Spirit is what attracted many of my classmates to UD and continues to attract prospective students, including my son, Ronnie, as well as faculty and staff to UD.

My second degree from UD, an M.S. in Materials Engineering, was the product of convenience. As an undergraduate student, I co-oped for five semesters during which I always took evening classes. As a result, I happened to accumulate enough graduate credits as an undergraduate student that getting my master’s degree only required three additional months of full-time study. Additionally, staying at UD to finish my master’s degree provided me with an opportunity to continue working with an excellent researcher, mentor, and teacher, Dr. Peter Sjoblom from the University of Dayton Research Institute (UDRI).

My third degree, a Ph.D. in Materials Engineering, was the product of “necessity.” About two years after I received my Master’s degree, my husband, Brad, and I decided to start our family. Even before we got married, we agreed that one of us would stay home with our children while they were young. I really wanted to be the one who got to be the stay at home parent, but at the same time, I did not want to become so out-of-touch with the engineering profession that I could never return. In considering my career options, I reflected on the impact that some of my engineering professors had on me throughout my five years as an undergraduate student. There were many occasions where my professors had gone out of their way to help me succeed in something I pursued. The notion of being able to have this type of impact on the life of a young person appealed to me. As a result, I decided that being a “teacher” like my Mom might not be so bad after all. In fact, I became quite passionate about becoming a college engineering professor. Becoming a college professor, however, required a Ph.D. In my overambitious twenty-something-year-old mind, I reasoned that getting my doctorate while having my family might be a good way to stay in touch with the engineering profession while also providing the credential I needed to become a college professor. After all, my

1Marianist, Marianist blogspot, 2009.
Mom had earned her teaching degree while raising my brother, sister, and me AND working at a factory.

By the time I had quit my job and decided to pursue my doctorate, I was seven months pregnant with my son, Ronnie. My husband, Brad, had an exciting job that he was uniquely qualified for working as a failure analyst for UDRI. Being one of the most selfless people I know, Brad was willing to give up his job and move so I could go to a different university. However, I could not let him make this sacrifice as he loved his job more than anybody I had ever met. Furthermore, my husband's entire family lived close by and my family was “only” 250 miles away. I did not want my children to grow up not knowing their grandparents, aunts, uncles, and cousins. So, while I might say I had to stay in the area, in reality, I wanted to stay in the area. Most importantly, the impending birth of my son and my desire to be a stay-at-home mom required me to find flexibility in a graduate program.

The Marianist Spirit of UD includes catering to the individual needs of the students. As such, it was really no surprise to me when the director of the Graduate Materials Engineering Program at UD, Dr. Jim Snide, expressed a willingness to work with my personal situation and goals. Not only did he allow me to do most of my work and research from home, but he also provided me with the tools and equipment that enabled me to do this. With the emotional, moral, practical, and financial support of my husband, I started my degree just six days before my son Ronnie was born, took my qualifying exams two weeks before my daughter Erin was born and defended my dissertation just a week and a half before my youngest daughter, Marie, was born.

After earning my doctorate, I chose to work for UD because I continued to be captivated by its Marianist Spirit and because I had developed an even deeper sense of commitment to the University. UD had treated not only me, but also my husband very well. My post Ph.D. career led me “back” to UD, first as a part time researcher for UDRI, then as an adjunct professor, visiting assistant professor and currently (but hopefully not for too much longer) assistant professor.

CAREER RISK 2 – TAKING TIME OFF TO BE A STAY-AT-HOME MOM

After receiving my Master’s degree, I accepted a job at the same defense-related organization where I co-oped as an undergraduate student. My professional duties, however, were significantly different from those I had experienced earlier. As a co-op I did materials-related research and spent a great deal of time working in the laboratory and working under the supervision of an excellent teacher and mentor. As a professional however, I was assigned to program management. Not being able to get into the lab and do research and having to spend a great deal of time on paper work was not appealing to me. Program management seemed very dull to me. More importantly, when I was asked to manage programs developing war-related materials, I also found my job to be in contradiction of my pacifist values and beliefs. How could I work on a program that seemed warlike to me? I have great appreciation and respect for the abundance of quality research, scientific advancement, and innovation that comes from defense-related programs, but I could not separate myself from the fact that the work I was doing was for military applications. “War” work was just not for me. I came to
realize that I needed more than a job or even a career – I needed a vocation. I needed to find a way in which I could use my engineering talents and skills to serve God by helping humanity.

Since I was not happy with my job, my husband and I decided that it might be a good time to start our family. So, after working for only two years, I made a major career shift and became a stay-at-home mom. During the ten years that I was a stay-at-home mom, I worked part-time in the evenings towards my Ph.D. and, eventually, as a quarter-time researcher at UDRI. Although many may not see the value of being a stay-at-home mom from a career-development standpoint, it was probably one of the most profound career-development activities I have ever experienced. Being home with my children taught me a great deal about time management, multi-tasking, burning the midnight oil to complete a project, how to find creative solutions to interesting problems, and the importance of communication. Most importantly, it helped to order my priorities of faith, family, and friends, and it helped me to paint a clear picture of the type of engineer I wanted to be – one who made a difference in the world and engaged in activities and research that were in alignment with my core Catholic values, including a commitment to social justice and peace.

CAREER RISK 3 – SERVICE-LEARNING BEFORE TENURE

When I finally started teaching at UD, I was hired on as a part-time adjunct professor. Although the position of adjunct professor does not provide professional security, it also does not have the same requirements and hurdles as a tenure-track position. I felt I had a great deal of freedom to put energy into the aspects of teaching that really interested me and to pursue things I felt had great value. My position was later changed to a part-time visiting assistant professor and later to an assistant professor. As luck would have it, two of the first people I met after becoming a visiting assistant professor at UD were Dr. Dave Herrelko, the director of The New Engineer Program, and Chris Schmidt, a graduate assistant that was hired to help facilitate the newly formed Engineers in Technical Humanitarian Opportunities of Service-Learning (ETHOS) Program.

Dr. Herrelko, introduced me to the concept and practices of service-learning. Some of the main objectives of the New Engineer Program were to provide opportunities for undergraduate engineering students that would help them to develop “soft” skills such as team work, communication, and leadership and to gain a better understanding of the relationship between engineering and society in the context of the Catholic faith in the Marianist tradition. The program offered faculty mentorship, dinners with professionals, special workshops such as interviewing skills, opportunities for students to attend cultural events in the community, scholarship money to take classes not related to engineering, and many other activities. A major component of the New Engineer Program was service. The first-year engineering students completed a large service-learning project as part of an Introduction to Engineering and Design course. They learned about the engineering in bicycles, collected used bikes, and then hosted a Wheels Day for deserving youth in the community. On the Wheels Day, the first-year engineering students worked with the youth to fix up a bike, learn about bike safety, and have some fun through a bike rodeo. I was very impressed as I could see the impact this program had on both the technical and the non-technical learning of the students. Students
who participated seemed more motivated to learn and more excited about engineering, and they had an opportunity to practice important non-technical skills such as communication and teamwork. Furthermore, I was delighted that the students were provided with the opportunity to see how they could use their engineering skills to help people and become involved in their community. I could not help but think that the students had been given a special gift—a deeper understanding of what one could do with an engineering degree and an opportunity to view engineering as more than just a career, but instead as a vocation.

The graduate student I met, Chris Schmidt, was running the newly created ETHOS international service-learning immersion program. The program involved preparatory sessions followed by a ten to sixteen week service-learning internship with an NGO or other organization that worked with appropriate technology in a developing country. Once again, I could immediately see the value of this program and wished I had the opportunity to participate in such a program when I was a student.

Reflecting on the value of both service-learning and the ETHOS program, I decided to implement an ETHOS related service-learning project in my materials laboratory course. Everything about service-learning made sense to me. It was a great way to “multi-task,” something I learned to value greatly as a stay-at-home mom. Students could learn by doing something useful and not “waste” resources or valuable time. The community partner could benefit from the work done by the students. Instead of conducting a lab experiment on test samples purchased just for that lab exercise so students could break them and write a report only I would read, the students were now testing materials for eco-efficient cook stoves and providing that information to a non-governmental agency that would not only read the report but also make use of the data. Additionally, the students were learning about another culture and about life in the developing world. They were able to use their engineering talents in ways that helped humanity and to see the impact of engineering decisions on the world around them. The service-learning project had the added benefit of providing a few of the students with the opportunity to present their work at a “stover” conference, which was an excellent experience for them. Service-learning seemed like a win-win situation to me. Although facilitating this project took a great deal of time, I found it to be time well spent as all of the stakeholders (students, “community” partner, and the university) seemed to benefit greatly from this work.

As a result of this project, I became very interested in the pedagogy of service-learning as well as appropriate technology and international development. I felt I had found my calling as well as my niche in engineering and in engineering education—a far cry from the way I felt as a program manager on a war-supporting research program. My interest in service-learning and appropriate technology motivated me to seek out additional ways to become involved in the ETHOS program as well as in service-learning and appropriate technology. Within a short time, I became more and more involved with ETHOS and eventually became its faculty director (in part because no one else really wanted to do it).

If earning my doctorate taught me anything, it was to never take things at face value and to question everything. As a result, neither my “motherly” intuition nor my professional intuition was
enough to convince me that service-learning was a sound pedagogy. I felt the need to verify my intuition through research. I started to dig through the vast amount of literature that was written on the topic. In doing this, I learned a great deal about the concept and practice of service-learning, as well as the advantages and disadvantages of this emerging pedagogy, especially in the context of engineering education.

Although I found many definitions of service-learning in the literature, all of these definitions include the integration of "community" based service projects into the curriculum with the dual goal of helping students learn course content through experiential learning and helping a service-organization or community partner meet a particular need. Through my research I found out that in order to achieve these goals, a properly-facilitated service-learning project must include three important components: "course" structure, community service, and structured reflection.2

Many of the articles I read identified some of the same key benefits of service-learning that I had observed through my own work. Among these key benefits were helping students to develop technical and non-technical skills; build self confidence; enhance problem solving skills, creativity, and ability to adapt to difficult situations; make connections between classes; develop racial and cultural sensitivity; enhance a commitment to civic responsibility; and increase ethical awareness and awareness of the impact of professional decisions on society and the environment.3 More importantly, I have seen students grow and transform through participation in service-learning projects. I have also seen students make life and career decisions based on these experiences.4 I have seen great partnerships and friendships develop between students and representatives from the community being served as well as partnerships between faculty members and students, all as a result of service-learning.5

Although my experiences resonated with the many educational advantages of service-learning presented in the literature, my research also provided me with a reality check in that it alerted me

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to some of the challenges and limitation of service-learning. I did not think much about these challenges before I became involved in service-learning, and I doubt that knowing about them would have deterred me from pursuing service-learning projects. Regardless, they do exist. One challenge presented in the literature, which I have also noticed, speaks to the problem of scale not only in the quantity of service-learning projects, but also the quality of these projects. Only a relatively small number (< 25%) of students end up participating in service-learning projects, even at universities that proclaim to have service-learning at the core of their institutional structures. Disturbingly, many students who have been involved in service-learning projects do not see the value of this pedagogy because of the way the project was facilitated or the "quality" of the project. One reason for this is the lack of a clear definition of what service-learning is and is not. Great inconsistencies exist in how service-learning projects or courses are developed and implemented. In particular, many community partners do not have a full understanding of the reciprocal nature of service-learning. For example, the community partner in a service-learning project I facilitated in one of my engineering courses failed to provide some of the communication as well as facilities required to complete the project. This had a negative effect on the students' learning as well as the students' perception of the experience. Because a widely-shared understanding of service-learning does not exist, students have a broad range of good and bad experiences with service-learning. Equally important, community partners can also have a broad range of good and bad experiences with service-learning and can sometimes feel exploited for the benefit of the students.

Another challenge with service-learning is the ethical and liability risks that exist with students (not degreed professionals) doing work in the community and/or in other countries. Safety and liability issues also exist when instructors take students off campus to work with tools and in locations that pose potential health or safety hazards. Even if these liability issues did not exist, the personal responsibility I take when sending students out to work in the community can often times be very stressful.  

Probably the challenge that I was warned the most about was the negative effect that being involved in service-learning could have on my ability to get tenure. It takes a great deal of time and sometimes money to implement a service-learning project in a course. The time required to implement these projects may take away from the time that an untenured professor should be spending doing research and writing journal articles and grant proposals. Furthermore, implementing a service-learning project can have a negative impact on teaching evaluations. At a workshop I co-organized in 2004 at the University of Colorado at Boulder with some very well-respected professionals who were actively engaged in service-learning, I was warned on numerous occasions that I should get tenure first and then worry about being involved in service-learning. Being somewhat stubborn and idealistic, I did not heed that advice. At the time that I was given this

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advice (2004), I had been actively engaged in service-learning through ETHOS and course based service-learning projects for nearly three years. I had become involved in these activities as a visiting assistant professor, when tenure was not a concern. Furthermore, even after I was placed on the “tenure track” in 2003, I did not have a full understanding of what was required to get tenure at UD nor how being involved in service-learning might be a detriment to achieving that goal. I felt surely that, at my beloved Catholic, Marianist institution whose motto is “learn, lead and serve” and where a commitment to social justice runs through heart and soul of the university, being involved in service-learning would be valued and not hinder my ability to get tenure.

Although my mid-term review, which was completed in 2006 by our departmental promotion and tenure committee, did not show overwhelming support for my service-learning research or work, the administrative support from both the Dean, Dr. Joe Saliba, and my department chair, Dr. Kevin Hallinan, for the ETHOS program and many of the service-learning projects I have facilitated has been tremendous. Their support suggests that this work is valued by both the School of Engineering and the university. Furthermore, in 2004, I was awarded the School of Engineering Award of Excellence for Teaching, and in the spring of 2008, I was awarded the Alumni Award in Teaching, largely due to my involvement with the ETHOS program and service-learning.

Despite the challenges and limitations associated with service-learning, I am of the opinion that the advantages greatly outweigh the disadvantages. Regardless of how my involvement has affected me professionally, I know for a fact that, much like my decision to stay at home with children, I would not, for a minute, alter my decision to be involved in ETHOS and in service-learning. I had learned through my early career experiences and my lifestyle choices the importance of making decisions and doing things that are in alignment with my values and priorities, even if that comes with personal and professional risks and sacrifices.

PARADIGM SHIFT IN ENGINEERING EDUCATION

As an engineering student in the 1980s, I heard very little, if anything, about international education, experiential, or service-learning. We were taught engineering through many lecture based courses and a few labs. We were taught to apply formulas to solve engineering problems from the book. We rarely worked on projects and, except for a few lab classes, we rarely were expected to work in teams. Our exams, although very challenging, generally consisted of solving a few problems that were no more than an extension of the problems we did as homework. We did not have to learn how to communicate with people through writing or through verbal communication, and we certainly were not expected to know anything about the world or travel. Most of the experiential learning my peers and I received was through co-op positions. Many of these co-op positions were with automotive related manufacturing companies that were thriving in Dayton at that time or with the research labs at Wright-Patterson Air Force Base. Upon graduation, we were expected to get a job with a company (most likely, a manufacturing, defense, or space industry), agency, or go to
When reflecting on this, I thought that maybe these observations of undergraduate engineering education were uniquely mine. However, by conducting an e-mail interview of some of my engineering classmates, I found they had similar memories of their undergraduate engineering education. I then began to wonder if these experiences were unique to students at UD. A review of the literature, however, indicated that the lecture-based pedagogy I had experienced as a student was typical for engineering education in the 1980s.

When I became an adjunct professor in the late 1990s, it did not take me long to realize that engineering education had changed since I was a student. I observed that many of the incoming engineering students at UD were from middle to upper middle class suburban “white collar” families as opposed to the rural and “blue collar” families of many of my classmates in the 1980s. Many students had grown up playing video games, many had attended academically challenging high schools that offered high-level math and science classes, and most were involved in numerous organized activities while in high school. Many, however, had very little, if any, hands-on experience in fixing things or in “tinkering.”

Furthermore, the face of engineering had changed quite a bit. Computers, the information super highway, and e-mail had transformed how the students, faculty, and professionals accessed data, solved problems, and communicated. Our society was experiencing an ever-expanding global economy and jobs in the engineering profession were changing from ones based in manufacturing and construction to ones that were largely service based. Furthermore, the incoming students I met expressed a desire to do more than just make money in their chosen career—they wanted to make a difference in the world. Therefore, students not only expected to be taught differently but they had to be taught differently in order to get a job they would view as fulfilling after graduation. Lucky me! I felt that the changing needs of the students and the new Accreditation Bureau of Engineering and Technology (ABET) requirements were right in line with my priorities and the outlook on engineering that I had developed during my early career experience and my time as a stay-at-home mom. To me, this seemed like a very exciting time to be part of the engineering academic community! As a result, I continued my research on the changing face of engineering education, and for those who share a similar passion, I include a rather extensive bibliography at the end of this chapter.

9 E-mail Interview, 2008.
One observation I noted, but found difficult to verify through research, was that the career aspirations of students had changed. When I was a student, I do not remember any of my peers specifically seeking a job that would make a difference in the world. Instead, most of my peers, including myself, looked for a stable job at a reputable company that offered good pay and benefits. At that time, the manufacturing sector was fairly strong in Ohio, so many of my peers worked in manufacturing related jobs. With few exceptions, most have changed jobs several times since completing their degrees. In contrast, many of the students I have advised over the past five years have looked for jobs at companies working in areas that help humanity, such as medical device companies or those related to sustainability, or they have taken voluntary service positions for several years after graduation. The only evidence I can find that supports the desire of engineering students to “do good” is the popularity of many service-based engineering programs such as Engineers Without Borders (EWB) and Engineering Projects In Community Service (EPICS). Both of these, as well as other similar programs, have experienced explosive growth in the past seven to ten years and have attracted women in ratios that do not match the demographics of the engineering student body.15

GROWING WITH THE ETHOS PROGRAM:

Probably the one factor that has contributed the most to the success of the ETHOS program is that it was founded by students for students. In a sense, it is a living example of “appropriate technology” as this program was not imposed on the students, but instead had very organic roots. The ETHOS program was developed by an interdisciplinary group of undergraduate engineering students in the spring of 2001, as part of a capstone engineering design course. The previous summer (2000), one of the founding students, Christine Vehar, had participated in an international service immersion placement in India, sponsored by the University’s Campus Ministry program. Her work involved tutoring and working with children. Although Christine felt this immersion was a wonderful and life changing experience, she was frustrated that she was not able to make use of her engineering skills while there, especially since she could see how many of the humanitarian issues that existed at her placement site could easily be addressed with rather simple engineering interventions. Christine approached, the Mechanical Engineering department chair, Dr. Kevin Hallinan, with these concerns. Dr. Hallinan challenged her to create a service-learning immersion program specifically for engineers. To facilitate development of the program, Dr. Hallinan provided financial sponsorship as well as mentorship and guidance. Generally, capstone design projects address industrial needs and are sponsored by local companies. Although this alternative would be considered unique at many other universities, at UD, it really just represented another way in which a professor nurtured the interests and intellect of a student. It simply echoed the Marianist Spirit of UD. The founding students were able to use the engineering design process to research and develop the program, establish its name and acronym, and make initial placement contacts with partner organizations.

Part of the research the students conducted included identifying and studying similar programs already in existence (at that time EWB was just being formed). In developing ETHOS, the students worked with UD's Campus Ministry to adapt an existing immersion preparatory short course to meet the needs of the engineering students who would be participating in this program. The founding students spent a great deal of time consulting with Brother Phil Aaron who ran the immersion program through Campus Ministry. Brother Aaron cautioned the students about "serving" versus "learning" and the potential for service-projects to have negative effects (economical, self-sufficiency, cultural) on the community being served. The students also used lessons learned from failed service projects at other universities to create a program that would not exploit people or communities in developing countries or suggest inappropriate or unsustainable solutions to the humanitarian issues the students would try to address. The president of UD at that time, Brother Ray Fitz, also shared a great wealth of experience with the students and provided support and guidance in the development of the ETHOS program.

The mission statement developed by the students for this program reads, "ETHOS was founded on the belief that engineers are more apt and capable to serve the world more appropriately when they have experienced opportunities that increase their understanding of technology's global linkage with values, culture, society, politics, and economy." Much of the excellent research and work that the founding students completed serves as the foundation for the ETHOS program today.

When I first became involved in ETHOS in the fall of 2001, the University was preparing to send its first set of five students on their technical service-learning immersions. At that time, no academic credit was awarded for this experience, few students were aware that the program existed, only a few students expressed interest in participating, and most of the travel arrangements and preparatory sessions were coordinated by the graduate assistant, Chris Schmidt. The graduate assistant was partially funded through the Mechanical Engineering Department but also had a research assistantship with a faculty member. Funding for the student travel was provided by various internal funding sources including the School of Engineering, Campus Ministry, Chaminade Scholar Program, and the New Engineer Program, and through personal and group fund raising efforts. As the program grew, I willingly, and with great enthusiasm, became more and more involved.

Within a short time, I became the unofficial director of the program. I worked with the various graduate assistants (they change every one to two years) to develop an elective course that formalized the preparation process, created a clear definition of the student deliverables, and provided participating students with academic credit. Additionally, the graduate assistant and I formalized the paperwork; created a handbook for the course, brochures, and a website; and we hosted seminars to advertise the program. We worked with the newly appointed engineering Dean, Dr. Joe Saliba, who committed funding and other resources to the program. We also wrote proposals to seek external funding for the program; wrote papers, and conducted research on service-learning, engineering education, appropriate technology and international education; participated in workshops and conferences; and made other efforts to collaborate and communicate with other professionals involved in similar programs and work. Within a few short years, the graduate assistant (Charlie Schreier) and
I developed an on-campus ETHOS club to provide awareness about global engineering issues and appropriate technology and to provide local service-learning opportunities as well as international spring break-out for engineering students. As the program became more popular, we developed an application and selection process for students interested in participating in an ETHOS immersion. As the Center for International Programs (CIP) at UD started to grow and become much more organized, we started to collaborate with their talented and committed new director, Amy Anderson, and the rest of the CIP staff to take advantage of the many resources they offered, such as safety information, passport fairs, on-line student registration, Study Abroad Fair where we were able to host a booth, and much more. We also worked with our development office to get funding for the program through private donors. Although much of the coordination work is still done by the graduate assistant, my role as faculty director is to provide continuity and growth to the program, seek funding, help coordinate the preparatory classes, provide the students with grades, seek new partnerships, and serve as advocate for the student participants. A third and very important member of the administrative team, the service-learning coordinator for the School of Engineering and the former consultant to the founding students, Brother Phil Aaron, was added in 2006.

Although ETHOS strives to offer a wide range of activities and experience, the part of the program that requires the biggest investment of my time, as well as the time of the graduate assistant and service-learning coordinator, is the international technical service-learning immersions. However, these immersions also have the biggest impact on the attitudes and perceptions of students. Since its inception in 2001, ETHOS has sent more than 120 engineering students as well as several students from other majors (Geology, Communication, Business, Computer Science) and even one student from a neighboring university to developing countries to work with development organizations and communities. Some of the host countries include Nicaragua, Honduras, Brazil, Bangladesh, Guatemala, Mexico, Bolivia, Cameroon, Togo, India, and Peru. The ETHOS international technical immersions are typically ten to sixteen weeks in length, during which time the students work with collaborating organizations and communities to assist in finding appropriate, sustainable, and effective solutions to technical challenges through guided research, development, and projects. Students generally travel in small teams of two to three students each. Since the students are required to do technical research prior to travelling, are placed with organizations that have an onsite technical director, and are involved in ongoing research and development work, the students are able to contribute individually, or as a team, to an existing or new project in the short amount of time that they are at their placement. In many instances, the students have even continued to work on these projects upon their return to UD then participate in another immersion the following summer at the same placement site to continue their research in a particular area.

Success of the ETHOS program relies heavily on well-established international partners. Because we send students (for the most part) to the same placement sites year after year, there is a clear understanding between the ETHOS program and the international partner regarding the responsibilities of the various stakeholders. Not only do the international partners provide technical guidance and mentorship, but they are also responsible for taking care of some of the logistics such as
identifying suitable host families and setting up the payment structure for the room and board. Most
of the well-established international partners are located in rural villages and small towns. Students
typically describe the people in these communities as “poor.” During the preparatory training sessions,
we stress to the students the importance of establishing relationships in the community and learning
with the community about a specific technology. Therefore, interaction with the host families and
the communities on a daily basis is integral to a successful immersion experience. Sending students in
small teams as opposed to large teams encourages the students to completely immerse themselves in
the community. As a result, the students end up learning a great deal about the culture, including the
local resources and skills of the community, and they are forced to become proficient in the language
spoken there. Most student participants tell us through their reflections and through discussion that
their host families and communities were the best part of their trip. We have had students give ballet
lessons to the children of a community, help coach soccer, read and play games with the children,
and even be “knighted.” With the help of the host organization and community, students are able
to use their engineering knowledge to address real world problems while learning about another
culture and gaining a better understanding of the interface between technology and global society.

Currently, students earn academic credit towards their engineering degrees by preparing for,
participating in, and documenting their ETHOS experience. The students participate in a semester-
long preparatory course that includes individualized language preparation facilitated through our
language department, travel safety and health, practical travel tips such as packing, cultural sensitivity
training, an introduction to appropriate technology, and guided research on the work they will be
doing at their placement. In the summer, the students participate in their technical service-learning
immersion in a developing country. Upon their return, the students are required to write a reflection
report and a technical report that summarizes their work, give at least two presentations, attend a
dinner with invited faculty and staff, and they also attend a reflection retreat.

Students are encouraged to continue their research when they return to campus and also
bring back projects that can be implemented in the classroom. As a result, some of our participants
have implemented ETHOS-related research and problems into other classes, such as their honors
thesis, experimentation lab, heat transfer, materials, and capstone design experience. One vision that
I had for the ETHOS program early on was to have students from other majors become involved in
ETHOS-related projects. I also had the vision of having our student participants be able to work on
a single ETHOS project throughout their academic career. This vision became a reality when one
of our ETHOS participants, Lori Hanna, decided to integrate her immersion experience into her
Honors Thesis work and her senior capstone design project. As a result of the work that Lori and
her teammates did during their capstone design course, they decided to partner with two business
students to enter a business plan competition. The students won this business plan competition and
are using their winnings to help finance the start up of a microbusiness, Salud del Sol, that will build
and distribute solar autoclaves in Nicaragua and beyond. As a result of this project, the School of
Business at UD has committed to sending up to two students each year on an ETHOS immersion
with an engineering student.
Personally, I have really enjoyed being involved in the development and growth of the ETHOS program and being able to discuss the wonderful accomplishments of the student participants and graduate assistants with colleagues from UD and elsewhere. Every ETHOS graduate assistant (Chris Schmidt, Bill Eger, Charlie Schreier, and Mike Vehar) has used his own unique gifts and talents to enhance the quality and organization of the ETHOS program. The program has been well received by the School of Engineering, UD, and our international partners. As such, working with this program has been a very positive and rewarding experience with few if any real struggles. I have enjoyed watching the engineering students at UD learn and grow through the international technical service-learning immersions, student organization activities, collaborative research, and hands-on classroom projects that support the development of appropriate and sustainable technologies for the developing world.

INTERNATIONAL EXPERIENCE THROUGH THE ETHOS PROGRAM

Although the aspect that attracted me first to the ETHOS program was the service-learning, I quickly realized the importance of the international experience that is provided through this program. As I mentioned earlier, the engineering profession has changed a great deal since I was a student in the late 1980s. The globalization of the economy makes international experience a necessity for graduating engineers, yet it is not always easy for engineering students, with their packed schedules, to gain such international experience. The internships offered through the ETHOS program represent one approach for engineering students to gain international experience. I have watched students who have participated in this program develop foreign language skills, gain an increased sense of cultural awareness and global civic responsibility, and have a better understanding of the role of engineers in society and in the world. Furthermore, I have seen them become far more confident in their abilities in general, but specifically, in their ability to travel and to live without many of the creature comforts that they had grown accustomed to.

Despite the many educational benefits offered through the ETHOS program, what appears to attract most students is their desire to use their engineering skills to help people and “save the world.” Although I believe most students embark on their ETHOS immersion thinking that they will be doing their part to save the world, in the end, it appears that the world is saving the students by providing them with the opportunity to take a risk, step outside their comfort zone, experience a new culture, and see the world and their chosen profession with a new, more mature, set of eyes. It is amazing to me to watch these students transform from somewhat naive, suburban college kids with idealistic values into informed adults who have a greater appreciation of the world around them and an ability to question our traditional way of doing things. Additionally, the ETHOS experience provides the students with a new notion of what it means to be successful. This new definition

no longer has to do with how much money they will make or their position in a company, but instead, how they might be able to make a difference in our world. Additionally, participating in ETHOS provides many of the students with the opportunity to view engineering as more than just a career—as a vocation.

HOW ETHOS INFLUENCED ME

Going from part-time engineer to full-time mom and then to full-time professor was a difficult transition for me. To be completely honest, and at the risk of being politically incorrect, I found staying home with my children, volunteering in their schools and in the church, and working a few hours from home doing research to be stimulating, challenging, and very personally rewarding. Simply put - I loved it. Prior to having children, however, I dreamed of a career in academia. As mentioned above, this dream stemmed from experiences that I had with professors while I was a student at UD. It seemed that no matter what “out of the box” idea I came up with there was always a professor willing to support that idea and to help me see that idea through. I wanted to be THAT kind of professor. The one who was able to provide the fuel a student needed to turn a spark into a flame - to turn a dream into a reality. As so many professors had done for me, I wanted to be the one to give a student a chance to succeed at doing something they had a passion for, even if that took them on a slightly unusual path. As my youngest daughter, Marie, was preparing to enter the first grade, I was presented with the opportunity to teach materials at UD. This felt like a dream come true for me as I loved the subject and loved UD. The offer was also timely since my children were all in school and I had a little more time to work.

My previous experience in engineering had provided me with a solid notion that I had to pursue areas of research and teaching that were in alignment with my personal beliefs and interests and for which I had a passion for. When I learned about the ETHOS program, it did not take long for me to realize that it was very much in alignment with my personal beliefs and interests. Furthermore, addressing issues of social justice, one of the key aspects of ETHOS, was something for which I had a deep passion. By being in the right place at the right time, I found myself with the opportunity to help grow the program, watch a student’s dream of such a program become a reality, and witness how participating in such a program could provide students with life-altering transformative experiences. The ETHOS program gave me the opportunity to use my professional skills to help humanity through the students and to help the students through humanity. ETHOS gave me a great gift; it made my job as a college professor my vocation. ETHOS is the main reason why I love my job!

The future of the ETHOS program looks very bright. Students are interested and engaged and are increasingly able to reach out to the larger student population to share their experiences and to bring others into their experiences. The administration has exhibited growing respect and admiration for the program and continues to support it financially. Because our acting provost and current Dean, Dr. Joe Saliba, has seen the impact that the ETHOS program has had on the participating students and community partners, views the ETHOS program as being in direct alignment with the mission
of UD, and understands how ETHOS has provided distinction to both UD and the School of Engineering, he has the vision of expanding the program such that every engineering student is somehow touched by the ETHOS experience. This expansion may include more classroom projects, local and domestic placements, as well as more international placements. Currently, the service-learning coordinator, acting Dean, Dr. Malcolm Daniels, and I are in the process of developing a five year strategic plan for this program.

The stories shared by the ETHOS students through blogs, family letters, TV interviews, local newspapers, campus publications, and ETHOS videos on youtube have inspired alumni, friends, family members, and local community members. This has fueled tremendous support for the program through financial contributions, additional collaborative opportunities and, most importantly, prayers. The administrative team continues to work well together and has a shared vision for the program that echoes that of Dr. Saliba's; it is in alignment with the principles of the founding students, and not only upholds, but further enhances the Marianist Spirit of UD.

Although I could never verify this, I believe that it would be very difficult to duplicate the ETHOS program at any other university. I attribute the creation and continued development of this program to the Marianist Spirit of UD. After all, it was the Marianist Spirit, the warm and welcoming campus community, that grabbed my soul when I came for a visit over 25 years ago and still, has not let go. It was the Marianist Spirit of UD, with its nurturing professors, mentors and bosses that encouraged not only me, but the students who founded ETHOS, to pursue our passions, even if that meant taking a "slightly" different path. It is the Marianist Spirit, with its commitment to social justice, that encourages and supports service-learning in general and the ETHOS program in particular. Finally, it is the Marianist Spirit that provides a transformative education for students, creating a network of alumni, family and friends that provide the financial and moral support to the students and to programs such as ETHOS.

I became involved with the ETHOS program because I thought the work the students were doing and the experiences they gained from the program would contribute greatly to the world. But let's face it – I have gained much more FROM the ETHOS program than I have contributed. Being involved with ETHOS has provided me with a way to use my engineering and professorial skills to serve God – at last, I have found my vocation!

Postscript – I received tenure in the winter of 2010.

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REFERENCES


