Differences in Leadership and Project Based Learning Outcomes in Developed and Developing Countries

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Andrew is studying mechanical engineering, is minoring in aerospace engineering, and is completing the Global Technological Leadership certificate at Michigan Technological University. Andrew has significant project experience as the project manager of the Aerospace Enterprise—one of Michigan Tech’s largest enterprises—and the Oculus-ASR project—a satellite project sponsored by the US Air Force Research Lab for university students to design, build, test, and launch a functioning satellite to low-earth orbit. In addition to his work with the Aerospace Enterprise, Andrew is also the president (vice president 2013-2014) of the Michigan Tech chapter of the Blue Key National Honor Society, the organization responsible for planning Winter Carnival, Michigan Tech’s largest annual celebration. Andrew has led these two diverse groups at Michigan Tech for the past year and will continue to focus on the educational and professional development value of each. In 2014, as part of the Pavlis Institute for Global Technological Leadership, Andrew traveled to Malta where he led a research effort to determine the role of the Maltese islands, specifically Gozo, in the Allied victory during World War II. Andrew also helped his fellow students prepare hands-on science and engineering demonstrations for elementary students in the country’s poorer regions.

Dr. Robert O. Warrington Jr., Michigan Technological University

Robert O. Warrington is currently Director of the Institute for Leadership and Innovation, which houses the highly interdisciplinary and innovative Enterprise program, the High School Enterprise program and the Pavlis Institute for Global Technological Leadership at Michigan Technological University. Dr. Warrington was Dean of the College of Engineering from 1996 to 2007 and was the founder and Director of the Institute for Micromanufacturing at Louisiana Tech University. Before joining Michigan Tech in 1996, he received his BS degree in Aerospace Engineering from Virginia Polytechnic Institute, his MS in Mechanical Engineering from the University of Texas at El Paso and his PhD in Mechanical Engineering from Montana State University. Dr. Warrington served in the US Army for two years and on the faculty at Montana State University for eight years. He was the head of the Mechanical and Industrial Engineering Department at Louisiana Tech University for 11 years, and was the Director of the Institute for Micromanufacturing from 1991-1996. Dr. Warrington was a founding advisory board member for the ASME Nanotechnology Institute. He is past VP for Education, Centers Sector of ASME. He led the ASME Vision 2030 study for the future of mechanical engineering education. He was a member of the Board of Directors for ABET after serving a number of years as a program evaluator, member of the Engineering Accreditation Council and the Executive Committee of the EAC. Dr. Warrington is chair of the Education Committee for the Pan American Federation of Engineering Societies (UPADI). Dr. Warrington is a Fellow of ASME and AAAS and is a member of the Pan American Academy of Engineering. He was an associate editor (now emeritus) for the ASME/IEEE Journal of Microelectromechanical Systems and has over 150 technical publications and numerous presentations (35 invited), and 49 research grants from foundations, government and industry. Dr. Warrington is the founder of the Commercialization of Microsystems Conferences, is a past founding president of MANCEF and currently is a member of the executive board for MANCEF. Dr. Warrington was an Associate Director for the Center for Wireless Integrated Microsystems, an NSF Engineering Research Center (2000-10). Dr. Warrington’s research interests include MEMS (particularly micro heat transfer and fluid flow), micromanufacturing, energy scavenging at the microscale, and micromechanical machining processes.
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Michigan Technological University created the Pavlis Institute for Global Technological Leadership with the help of alumnus Frank Pavlis in 2005 to teach ambitious students the leadership and cultural skills necessary for being successful in a globalized economy. The Institute was founded on the principle of educating future leaders through an in-depth study of leadership and discussions on cultural influences, and culminates with an immersive international leadership experience.

The definition of leadership has been debated for many years and frequently changes based world events, social movements, and economic developments. It is well-accepted that leadership is multi-faceted: formed by many different traits made evident in various situations. Whether it is in development of project management skills, vision, cultural awareness, communication, respect, and inspiration, leaders are shaped by their environment and their responsibilities.

For students travelling abroad to partake in leadership activities, the environment in which leadership is practiced has important influences on the type of skills developed. Many would agree that tutoring students in a different language, planning an event, building a water filtration system, or building a school house are all examples in which leadership skills in a broad sense are developed; however, differences in the political background, economic state, and many other factors impact the type of skills which receive the most attention.

This is no different for students in the Pavlis Institute. While most students travel to developing regions in West Africa or southern India, some students select developed countries such as Argentina or Malta. The Pavlis Institute provides tools necessary for leadership development in a general sense. Individuals have the opportunity for different experiences and learning outcomes depending on the level of a particular region’s development.

This paper discusses the fundamental differences in learning outcomes between international undergraduate student project work in developed and developing countries. Using Michigan Tech’s Pavlis Institute as the foundation, a clear distinction between aspects of leadership experienced is explained and the benefits of each are discussed. Regardless of the location or environment, international project-work provides students an invaluable opportunity to develop character and solidify their foundation of leadership skills.

Introduction

As economies trend towards globalization, countries seek interdependence and working internationally becomes increasingly important; students do well to gain experience interacting with other cultures. Whether their future is in industry, academia, or public service, students are be the leaders of tomorrow and will be expected to think and act globally.
In 2005, Frank Pavlis provided the resources to begin the Pavlis Institute for Global and Technological Leadership at Michigan Technological University. It was Pavlis’ hope to provide every student who graduates from Michigan Tech the means to develop leadership skill necessary to be successful in the globalizing economy. Enrolled students participate in leadership and cultural awareness discussions, lead service projects in the Michigan Tech community, and learn valuable insight into successful leadership, all in their first three years on campus. The heart of the Pavlis Institute experience is the summer of each student’s third year, where they are given the resources to plan and lead international projects while immersed in a new culture for five weeks. During the five weeks, the students work without faculty in country with only a local contact for emergencies. They are free to create their own international experiences.

Since its inception, over sixty students have graduated from the twenty-five-credit certificate program. With a growing class of alumni now leaders in fields of business, engineering, and many other disciplines, the immense breadth of leadership skills gained or perfected during the development of the Pavlis Institute has impacted organizations across the nation. Yet, as comprehensive as the program is, each student’s experience varies based on the location of their immersion experience. The environment in which leadership is practiced is a contributing factor in the types of leadership skills gained.

**The Pavlis Institute and its Global Reach**

The Pavlis Institute has afforded students of all education backgrounds the opportunity to practice their technological leadership skills in a variety of settings. Beginning with the West African country of Ghana, made available with ties to the Kwame Nkrumah University of Science and Technology in Kumasi, the Institute began developing projects such as education on the importance of clean water, improving the safety of using open-fire stoves, providing power to small villages and designing, building, and implementing a mobile health clinic in remote Ghanaian villages. With the adoption of these projects, the focus of the Institute was set on providing humanitarian services for the destination through a leadership learning experience for the undergraduate Michigan Tech students. As the Institute grew throughout the next few years, it was clear that additional project locations were necessary.

Over the next years, the Pavlis Institute broadened its reach to countries such as Argentina, India, and, its most recent addition, Malta. The addition of each leadership practicum location “demonstrates the maturity and success of the Pavlis Institute.” Each location brought about political, authority, and educational challenges, all of which were embraced by the students traveling there. The learning outcomes of the Pavlis Institute were changed by the experiences in the developed regions of Malta and Argentina; no longer could the Institute rely on providing need-based humanitarian projects in order to train leaders. Getting involved in established economies such as Malta and Argentina called for a change in the program that more completely aligned with the globalization trends of today’s economy.
**Fundamental Differences in Experience**

The different leadership skills gained while planning and executing international projects is determined almost entirely on the cultural standards for leadership, as well as the types of relationships established in preliminary meetings.

**Ghana**

As the first project site visited by the Pavlis Institute in 2008, Ghana helped set the vision of the Pavlis Institute toward developing global leadership skills through humanitarian projects. Over the past few years, students have implemented a number of projects including constructing a mobile health clinic (Figure 1) to provide health services to rural villages, collecting and distributing educational supplies to community centers and elementary schools, and surveying water drainage systems to reduce the occurrence of malaria.

![Mobile health clinic](image)

Figure 1: Mobile health clinic. The Pavlis Institute students who travelled to Ghana in 2013 outfitted a van with various medical instruments and first aid supplies. Doctors and nurses travel in the van to various Ghanain villages providing treatment for common eye ailments, checking blood pressure and heart rythyms, administring first aid, and offering medical advice.  

The teams of students visiting since 2008 have noted the hospitality of the Ghanaian people and their willingness to accept them into their homes and villages. Many students reflected on the mutual respect that they shared with those they encountered; as the 2014 team described their experience, they said “we also owe a lot of our success and happiness to our new friends we met along the way in Ghana… [They] helped transform Ghana [for us] from a place to do some projects into a second home.” This team undoubtedly experienced the importance of interpersonal relationships and their strength in accomplishing the teams’ goals.

In addition to the hospitality and friendship shared by the Ghanaian people, the immersion experience forced self-confidence upon the students. Whether it was the lack of clean water, the
presence of mosquitos and other large insects, or harrowing rides in a tro-tro through the streets, there were, of course, many instances that the students felt uncomfortable. Their experience in Ghana away from the comforts of their lives in the US, they said, gave them confidence in their ability to adapt and allowed them to become “comfortable being uncomfortable.”

India

While the status of India’s development can be questioned, the experiences encountered suggest a culture very different from that of the United States. Despite ranking in the top world economies, the widespread poverty, lack of basic infrastructure, and severe safety concerns in the regions visited by the Pavlis Institute are perceived as traits of a still developing country. In this setting, the differences in culture, everyday life, and personal interactions became the greatest challenges for students immersing themselves in India for the first time.

Of course, the students visiting India experienced technical challenges surrounding their humanitarian efforts. During the Institute’s first trip to India in 2012, the students identified a concern with the water supply which, for the next two years, became the main concern of the Institute’s India teams. In 2013, the team designed and built a system to transfer clean water from a well to a storage tank near an elementary school. The students visiting India in 2014 had the opportunity to design and construct a similar system that cleaned contaminated water using a bio-char filter. During both international experiences, the students also led various school lessons regarding hygiene and health, science and engineering, and entrepreneurship.

Figure 2: Pavlis Institute’s 2014 India projects. Left: a view of the biochar water filtration system built for a secondary school in Kunnankulathur. Right: a member of the 2014 team teaching a class of girls in Kunnankulathur the importance proper dental and hand hygiene.

The word most commonly used by the students who traveled to India as part of the Institute was ‘patience.’ They reflected on the differences in environment, perception of time, and even gender roles. It is widely known that seeking to understand other people is one of the most important tasks of communication and relationship building, as expressed in Stephen Covey’s *The 7 Habits*
of Highly Effective People. Patience, then, is the key developing this understanding; without it, one too quickly draws conclusions, relies on stereotypes, and develops delusions of superiority.

In the final report written by the students who travelled to India in 2014, they discussed how they were impacted by the gender inequalities while trying to carry out their projects. The team comprised of two male and two female students, all of whom were responsible for different projects. When the two female students approached Indian men, the men redirected the conversation to the male students and often left the female students out. When performing mechanical work, the female students were not allowed to handle tools and, in many cases, Indian men took over and performed the work for them. Reflecting on these experiences, one student wrote “when it comes to cultural differences, be patient!” It was not until the third or fourth week working with their contacts in India before the females students were also seen as leaders. “It takes time for them to adapt” and, to ease this cultural challenge for future students, they recommended to “be patient but also make sure to politely but clearly establish who the lead is on each project.”

The importance of patience in other aspects of the international experience was demonstrated by the students who traveled to India in 2012. For one student, her experiences of different perceptions of time in India were particularly frustrating. Whether it was waiting several hours for a taxi or simply the slower pace of life in general, she grew impatient. Reflecting on the experience, she wished she had realized her frustration sooner and put forth more effort to grow in patience and become more like the Indian people who were “masters at having patience.”

Malta

The extensive history and the geographic significance of Malta make for a people comprised of numerous cultures and backgrounds. Over 400,000 people live and work in this 120 square-mile European Union country. In its small size, rich culture, and popularity among western tourists or vacationing European students, the Maltese people may be quick to label visitors as outsiders. This can be seen in numerous works of Maltese literature, and was experienced by the students traveling to Malta as part of the Pavlis Institute in 2013 and 2014. In the final trip reports prepared by both groups, each reflected on the challenges this caused. More importantly, however, is the challenge that led to an emphasis on networking and building personal credibility. While the projects of the Institute in Ghana or India focused on humanitarian efforts and the students were more readily viewed as leaders, the Institute in Ghana sought to work with historical societies, the University of Malta, and non-profit organizations. The purpose of these projects focused more on building an environment of collaboration between the University of Malta and Michigan Tech and on establishing professional connections with various organizations.

The teams learned from the professors at the University of Malta that many professionals or organizations in Malta would not consider working with an individual for business unless they
have completed their masters or doctorate degree. This same limitation is placed on students in the United States; as students work on projects and interact with various companies, it is difficult to solicit a timely response. The situation changes, however, when someone with a vice-president or Ph.D. title initiates the contact, as they are more likely to respond.

The teams who traveled to Malta experienced first-hand the necessity of clear communication and either an advanced degree or a substantial network of people who could vouch for their credibility. One student said specifically “a business [relationship] cannot be made in one meeting. Friendships and partnerships require work, effort, and constant communication.” 15 While trying to find new projects in which future students could practice leadership, the teams found difficulty in building trust among their contacts in Malta. Whether it was a failure to communicate their intentions or a lack of trust, the students worked to overcome the challenges.

Reflecting on the experience, the students understood the importance of communication, networking, and building trust. In a developed country such as Malta, or even in the US, it is imperative to exude confidence and to build strong relationships to be successful in a business environment. Over the course of the two years in Malta, students in the Pavlis Institute worked with professors both at Michigan Tech and at the University of Malta to identify leadership opportunities for future Pavlis cohorts. Only through their persistence, connections, and networking efforts were the teams able to secure twelve projects in 2014 for the 2015 group (this was up from four projects secured in 2013). 16

**Common Leadership Skills Learned in All International Environments**

After discussing the different leadership learning outcomes of developed and developing countries, there are many similarities in learning outcomes that are important to recognize. Regardless of their travel location, many students reflected on the importance of perspective and developing a cultural understanding. Whether it was through professional relationships, patience, or culture-shock that comes with a completely new environment, the students experienced drastically different beliefs and learned how they impacted international collaborations. The most important lesson learned was “to be open to new ideas, to willingly accept ideas from different perspectives, and to be aware of fundamental differences in culture and beliefs.” 17 By attempting to understand the beliefs and culture of those with whom the students met enriched their interpersonal and cultural communication.

Many students also reflected on a newfound confidence in themselves. Having been immersed in a new environment, the students were able to connect with the people in country only with confidence in themselves and in their ability to communicate cross-culturally. With self-confidence, an open mind, and a willingness to listen and learn, all of the students grew “comfortable being uncomfortable.” 18
“Traveling with Pavlis puts students in the driver’s seat of their international experience. It's rare that students are given such freedom and flexibility to create in an international environment, and it fosters a level of growth that isn't usually possible on normal study abroad trips. It facilitates a confidence and self-assurance that is crucial to leadership.” 19

As economies across the world become increasingly dependent on one another, it is important for students in any field to understand the role culture has on international communications. Especially in engineering, where professionals work to solve international problems with products, services, and human-centered design, it is imperative to develop cultural perspective and to understand cross-cultural communication. Programs similar to the Pavlis Institute for Global Technological Leadership provide students the resources and opportunity to learn about themselves and experience how culture impacts business and everyday interactions.

The presentation will provide a forum for discussing the fundamental differences in leadership learning outcomes between developed and developing countries through a series of questions and audience participation. This is a critical question for discussion as more engineering programs look toward providing international education opportunities for their students.

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