

Advancing Cultural Knowledge: Experiential Learning International Graduate Study Training Programs in the Health and STEM Disciplines

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Abstract: *This paper, based on a review of the case studies of international experiential learning programs in the sciences and health sciences, discusses key characteristics of current programs in increasing cultural knowledge among graduate students in those fields, and proposes a set of guidelines for future program development.*

Introduction

In today's global society, acquiring cultural knowledge is an essential part of learning in adulthood. Although there is a need to incorporate this understanding in the health and STEM (Science, Technology, Math and Engineering) fields, many such departments do not address this content as part of graduate programs in their fields. One way to rectify this need is through international experiential learning opportunities in a professional, research-centric context. Experiential learning can be one of the most influential ways for adults to embrace this concept as "real" by encountering and learning how to live and work with people whose cultures differ from their own. We define cultural knowledge as ways of knowing and learning that emanate from cultural differences, such as ethnicity, geographic location, religion, political climate, and economic conditions (Regan, 2005, Merriam & Associates, 2007). Experiential learning happens in a number of ways, including learning in informal and formal settings, through conversations among individuals and groups, to studying and working with others who represent cultural groups different than one's own (Merriam, Caffarella, & Baumgartner, 2007; Fenwick, 2008).

The purposes of this paper are twofold: to share a knowledge generated primarily through case studies of health science and STEM graduate programs that have developed international experiential learning opportunities, and to suggest ways in which these programs could be strengthened to encourage the development of cultural understanding in their participants. We have found the most prevalent program models for these training opportunities have been internships, research collaborations, and short courses. We have chosen to study science-related programs for two reasons: graduates in these fields are moving into a work force that is increasingly international in nature, and there is a great need to train globally and culturally proficient professionals to develop, carry out, and communicate research and practical applications to meet public needs in developing nations. Described first are the methods used to collect data for this study, followed by three case study examples that illustrate these data. Next we address the major findings, and discuss the implications for research and practice.

Methods

For this study, we conducted an in-depth review of the literature on graduate level international training programs in the STEM disciplines and health sciences. Although there is a vast body of literature on an array of undergraduate study abroad programs and their long and

short-term impacts, there are few formal publications focused solely on graduate (post-baccalaureate) programs, or even mixed undergraduate-graduate programs.

Of the twenty-odd articles reviewed on STEM and health-related graduate international programs, fully three-fourths of these were either from health or engineering-related disciplines. The overrepresentation of these fields in the literature is likely due to two interrelated reasons. First, engineering and health and medicine are two of the scientific fields with the most recognizable real-world applicability and impact, so they naturally lend themselves to educational, international development projects especially within developing countries lagging in these areas. Second, these fields have a historical commitment to high-quality undergraduate and graduate-level education and a concentration of dedicated teaching faculty who have developed a variety of international experiential learning programs. Furthermore, the faculty members in nursing and engineering are encouraged to publish the results of their programs for educational and scientific advancement in a number of field-specific international education journals created solely for that purpose.

Conversely, most of the other STEM disciplines, such as biology, chemistry, physics, informatics, and even the applied fields such as ecology and environmental science, and agriculture are less well-represented in graduate educational program literature. This lack of literature is primarily due to complex institutional, funding, and field-specific demands on these faculty members to generate research-based publications for career advancement--a process which is largely reiterated in their education and training of graduate students.

Findings

In reviewing these studies, we discovered that detailed programmatic and/or evaluative publications on international graduate programs are scarce and largely limited to those in the health or engineering fields, due to the factors noted above. From those materials we reviewed four program models are prevalent: the sandwich degree, short-course, internship, and individual research. The traditional form of international research experience in the 1970's and beyond were so-called "sandwich degree programs," which involved spending 2-3 years of one's degree doing research or fieldwork outside of the United States (U.S.). New, shorter programs are deliberately crafted to allow graduate students to spend shorter periods of time abroad, usually a few weeks to a few months. This allows for immersive cultural and interdisciplinary learning, and continued progression through a degree program with incorporated global opportunities that are supportive of a student's primary research and/or career interests and graduate requirements.

The most common graduate short-term program models found were short-courses, internships, and research-abroad programs (Parkinson, 2007; Spencer & Tuma, 2002). The short course is usually a two-week to two-month course developed and facilitated through a partnership between the home university and a foreign university or institution which hosts the course, and often includes participants from outside of the founding institutions. In contrast, internships and research abroad are primarily focused on individual participants and rely on student application, company recruiting, and institutional or lab-specific relationships to facilitate a student doing part of his or her graduate research abroad. Service learning projects are an alternate short-term model common in and largely specific to the health and engineering disciplines, which are best-suited to programs with an immersive, team-oriented framework and concrete, specific goals, such as the construction of houses, or running of temporary clinics. As programs models can be both indicative of a program's rationale, objectives, and goals, as well as

key variables, including program duration, size, and partner institutions, the model used can have a huge influence on program outcomes (Spencer & Tuma, 2002), a factor that is discussed in more detail later.

Our most unexpected and significant finding from our literature review was that many of these programs place relatively little emphasis on advancing or evaluating their participants' cultural knowledge within their publications. This lack of acknowledgement does not necessarily imply that graduate participants did not have meaningful cultural experiences or come away with a deeper cultural understanding. Rather, the specific advancement of cultural knowledge may not have been identified as a primary goal of either the program or the publication in which it was featured. Repeated emphasis of case studies on, for example, "international agricultural research" (Phillips et al., 2008), or "a global living laboratory" (Sadjadi et al., 2009) imply that the directors and developers of such programs do intend that their students attain an international research-based cultural understanding, but may be unable or unwilling to use the term "culture," perhaps for fear of it sounding too vague or subjective.

The Case Studies

We present three case studies of international STEM and health based educational programs: a short course on agriculture and rice research, a research abroad program in nursing science, and an internship for research experiences in engineering and computer science.

The Rice: Research to Production Short-course.

The "Rice: Research to Production" short-course started in 2007 as a collaborative project between Cornell University and the International Rice Research Institute (IRRI). The three week course, hosted at IRRI in the Philippines, brings together graduate students, junior scientists, and undergraduates from around the world to more fully consider global agricultural and food security issues by engaging in and learning about rice cultivation, agricultural research, and farmer extension (Phillips et al., 2008). Since its initiation in 2007, over 80 participants from 28 countries, including over 30 graduate students, have taken part in the course.

The article featuring this course highlighted two main program objectives: encouraging plant science graduate students from developed nations to consider a career in international agricultural research, and creating an international network of young scientists to help solve food security issues. In addition to fieldwork involving students in traditional and modern rice cultivation, the interaction and relationships built between the diverse group of participants from a range of countries, disciplines, professions, and experiences added an additional, meaningful international dimension. Field trips to the local rice growing communities and farmer interviews, not mentioned in the article, also were significant cultural experiences (unpublished data). One graduate student indicated that the course "reminded me that I began studying agriculture because of its essential place in supporting lives and societies," while another observed: "it has been inspiring to join the group of scientific contemporaries...who, despite originating from a hugely diverse range of backgrounds have so much in common" (Phillips et al. 2008, p.14-15). Even though gaining cultural understanding was not explicitly defined as a course objective, it is evident that the program still impacted the cultural understanding of these graduate participants.

The Minority International Research Training Program.

The Minority International Research Training Program (MIRT) was initiated in 1994 by the College of Nursing at the University of Illinois at Chicago to give qualified undergraduate and graduate minority nursing students an immersive experience in global nursing research. Each student was paired with a faculty mentor to carry out a 10-14 week research project on a local biological or social health-related issue at a host center in one of nine countries across Asia, Africa and South America, including Malawi, Chile, and Thailand (McElmurry et al., 2003).

MIRT program developers specifically cited cultural sensitivity and the ability to work with people from diverse fields and backgrounds as a requirement for success in international health workers. Increasing the cultural knowledge of the student participants was therefore not only a goal of the program, but a resource in and of itself; program developers placed great value on the broader cultural perspectives gained by both students and faculty for their potential impact on health policy and research. An intimate student/faculty mentor relationship was cited as one of the most influential components of the MIRT program, as faculty mentors were essential in strengthening their students' skills in cultural assessment and problem solving. The program structure was clearly laid out to facilitate cultural knowledge as an aspect of personal and professional development. Students are expected to show predeparture preparation in cultural diversity and international research ethics, participate in cultural activities during programs, and evaluate their own cultural experiences as part of a post-program report. For their part, faculty and directors are expected to assist in students' cultural development by conducting a predeparture cultural orientation, counseling students dealing with cultural shock, and are involved in pre-and post program assessments of each student. At the time of the 2003 publication, the program was also planning annual follow-up surveys to track, among other aspects, the global and cultural development of past MIRT scholars.

Clearly, this experiential learning nursing program has made cultural knowledge a priority for their graduate participants by embedding it in their planning, implementation, and evaluation stages. While the article did not present any specific results or evaluatory data, if the comment of a student who noted: "My future career in research depends heavily on my objectivity...we must not judge people using our culture as the rule, but accept the various cultural norms and differences," may be taken as evidence that the program has been successful in raising students' cultural knowledge in a professional context (McElmurry et al., 2003, pg 27).

A Global Living Laboratory for Cyberinfrastructure Application Enablement

This internship and collaborative research program for graduate and undergraduate students was initiated by Florida International University (FIU) and Florida Atlantic University (FAU). It is a part of a multinational collaboration among universities, industrial labs, and national research centers in six countries: the U.S., Mexico, Spain, Argentina, China, and India. The program accepted its first group of 18 students from FIU and FAU in 2008, 12 of whom were graduate students. All participants took part in a pre-travel semester-long cultural and language training program for their country of interest, and then completed collaborative research/internships at an overseas institute or company over the summer.

The semester-long cultural and language training course was the primary cultural education component unique to this program. Although the course was not conducted overseas, it was an experiential learning component that utilized interpersonal and online teaching of

“survival vocabulary” including technical terms and useful phrases, and “proper cultural behavior, business etiquette, and differences in manners” (Sadjadi et al., 2009, pg. 68). Each student also worked intensively with at least one faculty member at their home university and a faculty or executive mentor at their international host institute. Faculty developers of this program strongly emphasized a student centric, integrative approach to education, featuring local-international, basic-applied, and academic-industrial linkages. Additionally, students and faculty were chosen for diversity in disciplines, gender, race, and ethnicity, with the aim of building an international network of researchers. While this program is so young that no formal educational evaluation has been published, participant comments indicate that both the mentorship and international research experience affected their cultural growth in that they “develop[ed] quite a bit as a person, researcher, and professional” and that, “being able to interact with new cultures, new people, new places... has enriched my mind (Deng et al., 2009).

Despite fundamental differences in program models, disciplines, components, and objectives, it appears that the three programs presented as case studies managed to achieve definite, although informal, indicators of intellectual and cultural growth from their participants, indicating that no one model or instructional format could be considered ideal. Even within this limited sample, it is possible to identify some shared elements or considerations important to facilitating personal and professional cultural growth in these science-centric, short-term graduate training opportunities. These include: 1) a recognition, whether explicit or implicit, of the importance of cultural knowledge for graduate students; 2) the development of strong intercultural, personal relationships between advisors and students, or within a diverse group of participants; 3) the building of a constructive environment in which these relationships can develop; and 4) a well-designed program framework with built-in support systems for institutional, student, and faculty development and evaluation of cultural knowledge.

Implications for Program Development and Research

Based on the critical factors identified through our review of the literature on graduate training programs in the health and STEM disciplines, we suggest a simple set of general guidelines for integrating and enhancing cultural knowledge through international programs for graduate students in the sciences and health sciences.

Recognize and include cultural knowledge as a specific program goal.

Build the program around staff, faculty, host and partner institutions, and student participants who represent and support cultural diversity and intercultural relations.

Construct educational, research, living, and recreational environments in which participants have the time and space to develop meaningful cultural relationships.

Require staff, faculty, and student participants to do formal or informal evaluations prior to and during the program, and formal short and long-term surveys after the program.

Use these reflections and evaluations to determine whether graduate participants have developed their cultural, and make improvements in the program accordingly.

Publish or otherwise communicate widely the structure and successes of your program to colleagues, educators, and other institutions, so that others in the larger scientific community might also benefit from your experience.

In order to build these international networks and collaborations for graduate students who will become the next generation of global scientists, current researchers must take a step back and work on cataloguing, documenting, and evaluating their own international programs to determine the available resources and how they may be improved. To do so, they may have to reach out beyond their specific disciplines, perhaps to the more experienced program planners in the social sciences or the health and engineering disciplines that already have a history of incorporating cultural knowledge in their graduate training programs. Consultation with specialists in adult education or community development with practical experience in cultural knowledge and experiential international education may also be helpful. Realistically, funding agencies may have to either require or jointly manage and facilitate the development of a network or database to organize websites, publications, and other information from international training and education programs across scientific disciplines and educational levels, which would itself be a valuable resource for researchers, teachers, and students alike.

Further studies must also be conducted to determine how different component of program planning models, such as duration, participant diversity, location, and activities, can affect the development of cultural knowledge. (Caffarella, 2003, 2009; Green & Kreiter, 2004) As the review we present here was a singular cross-sectional assay of the available programs, it would be interesting to also conduct a series of longitudinal studies following various programs to determine if the factors identified as important in promoting cultural knowledge are similar in both studies. Finally, this study focused mainly on the effect of short-term international graduate programs in sparking greater cultural knowledge and sensitivity among graduate students. A complimentary comparative study evaluating the longer-term international sandwich degree programs and their effect on more professionally useful development of cultural mobility and adaptivity, would be the next logical investigation in this area of adult experiential education.

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