Paper 30. Education for Sustainable Communities through Student-Centred Research

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Abstract

A trilateral project between Canada, Mexico and the United States was designed to address the need for an interdisciplinary study of sustainable communities. Four universities and two colleges of these countries established an effective partnership in the full knowledge that an international academic exchange experience would provide students with in-depth, global understanding about sustainability and infuse them into better civic engagement and decision-making for their countries.

Three steps were developed: online course related to environmental well-being and indicators of sustainability; methods for field-based, applied research; and field-based research. The main trilateral aim and objective was to develop a unique interdisciplinary approach to the comprehension between environment, sustainable communities, civic society and climate change for real-life problems within each country.

The experience for the students was invaluable. They interacted in a real-case scenario of another country whose challenge was to propose a sustainable solution in order to fulfil the community's neediness.

This article will focus on Mexico City active participation in the North American Mobility Programme which was sponsored by the Secretaría de Educación Pública (SEP, Public Education Ministry, Mexican Federal Government). Besides, the Colegio de Ingenieros Ambientales de México, A.C. (CINAM, College of Environmental Engineers of Mexico, A.C.) was a strategic partner for obtaining a complement British Council Mexico funding and developing instructional material.

1 Introduction

Sustainability is a wide-ranging topic of conversation and has crossed borders in order to work collaboratively and solve problems not only locally, but also regionally. North America is not the exception of these. The North American region has a population of approximately 360 million (UNdata 2009 cited in Blatant, 2013) and a combined GDP (Gross Demand Product) of over current US $16.2 trillion (IndexMundi, n.d.). Collaborative efforts and leadership between these nations had been addressed for significant developments. Consequently, the North American Mobility Programme (NAMP), funded by the Ministry of Education or the corresponding governmental entity in each country ─ HRDSC, SEP and FIPSE (Canada, Mexico and US, respectively), resulted in fostering regional integration that may draw upon the European Union's example of integration.

Despite the increasing importance of such regional integration, most students were looking international education far from these boarders. During the foundations of the NAMP Project (2006),

'[…] less than 4% of all US students who studied outside the country did so in Mexico and approximately 1% studied in Canada. The percentages of students studying in the United States as a percentage of international students studying in the country [were] quite small: 2.5% for Mexican students (2005-2006) and about 5% for Canadian students. The number of Canadian students who [went] to Mexico [was] tiny and this imbalance of students crossing borders in North America bodes ill for all parties, given the ever increasing importance of regional integration currently taking place' (Life, 2007, p. MOV-4).

One of the best ways the Consortium comprehended this integration was through the interdisciplinary study and research into sustainable communities. Therefore, it was found a window of opportunity to focus on promoting regional sustainability mindedness suited to the needs and conditions of each country. The '[…] [NAMP] Project was designed to address the need for interdisciplinary study of sustainable communities in regard to environmental issues in North America that [built] general knowledge for better decision making and the depth needed to better [prepared] students for their careers and higher levels of civic engagement […]' (ibid.). This was proposed by four universities and two colleges: in the US ─ Daemen College and Prescott College; in Mexico ─ Universidad de Guanajuato (UGto) and Universidad La Salle Mexico (ULSA); and in Canada ─ St. Francis Xavier University (StFX) and University of Northern British Columbia (UNBC). Each university/college contributed with its strengths:

'Daemen College [focused] on environmental indicators and their role in sustainability and the built environment. [Prescott College used its experience in sustainable educational assessment]. St. Francis Xavier University [specialised] in the application of environmental responsibility to the best practices in health, while the University of Northern British Columbia [focused] on health, water, and air quality as determinants of the sustainability of indigenous peoples and their communities. [Universidad La Salle provided] research opportunities for students in the relationship between the quality of air, water, and health in a [metropolis], while the [Universidad de Guanajuato concentrated] on the environmental determinants (especially water and air) in historical and cultural preservation' (ibid.).

2 Project design

NAMP proceeded in five major thrusts: (1) the design of a common online course which was centred on '[…] the understanding of sustainable communities through the introduction of environment as the pivotal issue' (ibid.); (2) the research methodology course which aim was '[…] to increase students' research experiences and skills through student-centred, applied research projects' (ibid.); (3) the students experienced to learn courses (up to 9 credits) from the area of specialization of the host institution; (4) the development of the appropriate specialized language courses; and (5) the student's self-assessment of their learning outcomes and exchange experience.

2.1. Students' selection

The Consortium '[expected] to draw mostly from […] third and fourth year undergraduates and some graduates students' (ibid.) in any area, spanning from History and Spanish Literature to Cybernetic and Environmental Engineering. Mexico City students, who had a general interest in sustainability, international ventures and participated in NAMP were mainly engineers (75%) and the rest architectures (25%). The level of English that was required depending on the host university, but it was not less than a 550 Paper-based TOEFL score.

2.2. The Centres

The idea was to create a Centre of Sustainability in each university/college. Some of them, like Daemen College had already one, so it was a model to be replicated at the other institutions according to their needs and facilities. 'Each institution [absorbed] the specific functions into an existing structure to allow for flexibility and inclusion and to check bureaucratic expansion' (ibid.). The purpose of their creation was to engage students, academic staff, community residents, and civic leaders with communities in order to promote local responsibility and sustainability that lead to citizenry, and to publish findings on a shared website.

2.3. Project website and online Think Tank

The Consortium decided to maintain a shared website with a common corporative image. 'The website [served] as a recruitment vehicle, providing information and features, and contact information for each institution. The commonly-developed course material was available online […] through the shared Blackboard classroom' (ibid.).

2.4. The Curriculum

Three main courses were considered for the NAMP exchange experience:

1. Course One: Environmental Well-Being and the Indicators of Sustainability

The Consortium designed this common course that was an essential requirement before the student went abroad to the host university. It was an interdisciplinary course, developed by all participants and offered electronically in Blackboard platform. Its core offered '[…] a sophisticated cross-national and regional understanding of environmental well-being and indicators of sustainability […]' (ibid.).

Eleven modules were developed for the curriculum, which covered topics such as: Populations and Biodiversity; Energy; Solid Waste and Recycling; Water; Food; Critical Health Issues; Business and the Economy; Green Architecture and Historic Preservation; Culture and its Effect on Sustainability, and Personal Responsibility. All of them were compulsory and have specific readings, online references, discussion questions, English-Spanish glossary and expert academic staff contacts.

2. Course Two: Methods for Field-Based, Applied Research

This course depended on each institution. It could be created as a new curriculum or used an existing one. The objective of the course was to approach the student to field research methods and to adapt them to a particular focus.

The objective of this course was that students clearly understood qualitative and quantitative research methods in order to apply them to Course Three. Practice Based Learning (PBL) was applied as a pedagogical active learning technique. At the end of Course Two, students were competent to conduct data, face-to-face interviews and surveys in the field, make direct/participant observations and analyse data. For instance, they were capable of identifying the most convenient way to approach to the community; so, in line with the circumstances, they used interviews, leaflets or presentations to be in communication with the people.

3. Course Three: Field Based Research

This part of the curriculum development was specific to each campus because it was '[…] the experiential companion to the previous two courses. It [focused] students on a research project that [was] specific, […], manageable, and adjustable to each student's level. Each institution [developed and offered] projects from which students [could] select' (ibid.).

In this course, students Learnt Through Service (LTD) by interacting with the host university-community leaders and collaborating around the community's needs. The experience incorporated community engagement and service, human-centred design and economic issues, which were reported to the host and guest institutions.

2.4. Evaluation plan

The evaluation of each course was based on two main areas: one, knowledge of sustainable communities and the environment and two, specific skill development ─ including critical thinking, presentation skills, affective judgment, contextual competency, and language proficiency in two of three categories: written, oral, or cultural. Student learning outcomes were measured primarily using electronic portfolios or having face-to-face interviews. Furthermore, the self-assessment of their experiential learning was extremely useful for the following academic year.

2.5. Funding

The principal funding was given by the Ministry of Education or the corresponding governmental entity in each country ─ HRDSC, SEP and FIPSE (Canada, Mexico and US, respectively) through 2008-2012. In Mexico, additionally to the SEP funding, the Universidad La Salle sought for other opportunities. In 2010, as a complement of the SEP funding, there was a prize given by the British Council and the National Ecology Institute through an academic-related staff member who was a Latin American Climate Champion. Moreover, it was supported by Colegio de Ingenieros Ambientales de México, A.C., which is an organization that worked with ULSA for instructional materials in the topic of climate change.

3 Implementation and Results

During the grant period, the two Mexican institutions sent 15 students; eight of them were sent by Universidad La Salle Mexico with an English level of a Paper-based TOEFL score of no less than 560. In **Table 1**, it is shown ULSA student's backgrounds and mobility.

Table 1: ULSA Student's backgrounds and mobility.

Faculty of	Num. of Students / Backgrounds	Host University	Mobility
Architecture and Communications	2 / Architecture	Daemen College	Michaelmas Term 2010 and 2011
Engineering	2 / Cybernetic and Mechanical Engineering	StFX and UNBC	Lent Term 2011
Chemical Sciences	4 / Environmental Engineering	UNBC	Lent Term 2012

The students' interests spanned renewable energies, green architecture and aboriginal business (62.5%, 25% and 12.5%, respectively). During their stay, they did a field-based research in a community, proposed real solutions and reported to their tutors. They experienced difficulties but they solved them in the field.

It can be clearly seen from their reports and end-of-term interviews that they enjoyed learning from other cultures; comparing and contrasting national and international experiences; and being challenged for a real-life community problem, which long-term solution was suggested by them.

The authors selected two representative examples for the La Salle exchange experience. One project is related to an indigenous approach between Mi'kmaq (Canada) and Totonac (Mexico) communities, and the other to a hot water piping system analysis. The former was focused on the Canadian indigenous people who could create and implement a development model of Nation-Building Approach without revolts or violence. An economic sustainable approach was found by trying to reply the Totonac entrepreneur programme, where young rural people, aged between 18 and 39 years old, are trained and financed for productive projects installed on purchased or leased lands. This is an economic sustainable solution for the Canadian community in order to let them stay in their homes and build new revenue opportunities (Mayoral, 2011).

The other project was related to a district energy system which distributed heat from a central power plant to eight buildings through a Primary Hot Water loop (PHW). The objective was to improve the hydraulic efficiency and to prepare the installations for the inclusion of a biomass gasification heat source. The project showcased the use of bio-energy as a sustainable, carbon-neutral energy source with much higher energy efficiency than the previous fossil fuel-based heating system. It was expected savings of 140 tonnes CO_{2e}/year (Flores, 2011).

Throughout the time of the exchange experiences, we recognized that the student's learning process in context can be basically identified in fulfilment of the learning cycle of Kolb's model (**Figure 1**) as follows:

a) Did basic activities in the community in accordance with the necessities of the established project in order to explore the location and the potential problem (Concrete Experimentation).
b) Thought about the sustainable solution for the community (Reflection).
c) Applied the previous knowledge learnt of environmental well-being, sustainability and research methodologies in an already known situation (Abstract Conceptualization).
d) Evaluated the project and did something new or more sophisticated based on the prior learning (Active Experimentation).

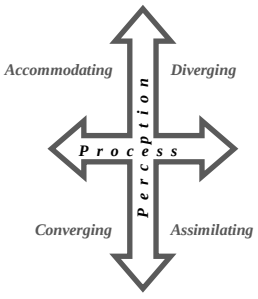

Figure 1: The Learning Process in context. Adapted from Kolb (1984).

Alongside the student's accomplishments, there were also academic-related and academic achievements. In academic-related attainments, the Consortium decided to work through a corporative image, which copyrights and royalties are for ULSA. The crucial decisions were taken in annual meetings; the first one was hold in Daemen College (2007), then UGto (2008), next ULSA (2009), UNBC (2010) and finally Prescott College (2011).

Not only was NAMP an inter-institutional project, but also within ULSA. The Faculties of Architecture, Design and Communication; Chemical Sciences; Engineering and Business worked together. Fifteen academic staff members were involved on the on-line course and two in the research methodology. For the applied research in communities, students and teachers went to the field and made the diagnosis of the needs of specific counties, like: Estado de Mexico and Puebla. As a result, the major interests of the community were: improvement of manufacturing processes for dying materials, fair trade and marketing strategies for their products, and environmental education in their primary schools.

4 Conclusion

Education for sustainability must include an integrated, interdisciplinary approach in order to balance social, economic and environmental dimensions. It must also consider both equality and equity to address the issues of vulnerable people (Vargas, 2000).

'Properly implemented student-centred instruction can lead to increased motivation to learn, greater retention of knowledge, deeper understanding, and more positive attitudes towards the subject being taught' (Collins and O'Brien, 2003, p. 1). An expected result in the sponsored project was that the eight students developed stronger sense of curiosity, heightened enthusiasm for learning and readiness for higher levels of applied research. 'In this sense students did become acquainted with vital issues affecting all three nations, developed a greater sense of their own commitment to civic well-being, and have become better critical thinkers' (ibid.). Moreover, the practical knowledge of each project aimed to measure the environmental, social and financial performance over a period of time; hence, they learnt some sense of the relationship between the three Ps of the triple bottom line (TBL): profit, people and planet by working collaboratively.

Accordingly, students who travel as part of this programme developed a comparative and integrated understanding of the larger regional problems affecting local, long-term environmental, social, cultural, and economic well-being. They were provided with incentive and knowledge to engage local and North American issues affecting the evolution of sustainable communities. This exchangeable, life-long learning experience created strong perspectives and global skills in today's students who would construct more prosperous, stable societies. Besides, it developed flexible knowledge, effective problem solving skills, self-directed learning, effective collaboration skills and intrinsic motivation for better civic engagement and decision-making for their countries.

On the other hand, this project contributed to enhance exchange experiences between North America. One example is the 2012 Open Doors Report on International Educational Exchange, which states that 'the number of international students at colleges and universities in the United States increased by 6% […], while U.S. students studying abroad increased by 1%' (IIE, 2012). Hence, the funding and the opportunity given from the three governments have been exploited by the students.

NAMP faces significant challenges, such as: 1) to incorporate the knowledge not only in close-knit communities but also in its authorities, 2) to build a Virtual Centre of Sustainability in each institution

in order to exchange information among communities and partners, and promote the understanding of sustainable communities, and 3) to have international exchange mobility of academic staff.

The partnership among the six North American institutions has resulted in continuing student exchanges, integrating curriculum developments and laying the foundations of academic staff experiences. Nowadays the Consortium is seeking opportunities for continuing this effort like forging alliance with universities, institutes and organizations/agencies.

5 Acknowledgements

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