

Green-Space for Healthy Living and Stormwater Management: A Study Abroad and Challenge Approach

Introduction

Natural resource conservation interests, improving food security, urban resiliency and promoting cultural heritage have embraced the concept of green space in urban agriculture, ecosystem conservation and planning. Green space in urban areas is a systematically managed network of open space that conserves ecosystems, provides food and associated benefits to human populations. This network includes wildlife habitat, water management, air and water quality, climate mitigation, urban forestry, urban agriculture, and the public realm infrastructure needed to support healthy lifestyles such as parks, community gardens, sidewalks, trails, and street trees. As teachers we struggle with how to introduce this important concept in innovative ways. Kareem Usher an assistant professor of City and Regional Planning at The Ohio State University and Aavudai Anandhi, assistant professor of Biological Systems Engineering program, Florida Agricultural and Mechanical University developed two novel techniques to teach the concept – green space in urban agriculture, stormwater management, ecosystem conservation and planning.

Background

Most university planning curricula incorporate at least one planning studio course for Master's-level students. Similarly, most agricultural and biological engineering curricula incorporate at least one natural resource conservation engineering or hydrology course for undergraduate students. These planning studios and conservation engineering projects are an opportunity to provide students with 'real-world' planning experience that would prepare them for the job market either in a private planning or design firm, or with a municipal planning or state and federal conservation agencies. The expectation is not only that the students would work with a client/project to produce a plan at semester's end, but also, gain experience working in teams and with practitioners across disciplines.

Usually these planning studios occur locally, that is, within the city where the university is located. However, in this case, Dr. Usher partnered with the Belize Association of Planners (BAP), St. John's College Junior College (SJCJC), the Belize Ministry of Health and the Kark Heusner Memorial Hospital, located in Belize City, Belize, to provide an enhanced service-learning experience for students while providing technical support to the Belizean clients through three projects: Comparing Urban and Rural Healthcare Access, St. John's Campus Mangrove Lounge, and Between the Canals: Neighborhood Reimaging.

While the concept - green spaces are often introduced in natural resource science or engineering using projects in hypothetical areas or case studies, Dr. Anandhi has been introducing the concept for the past three years using a challenge prize for a real world problem. Each year the United States Environmental Protection Agency (EPA) promotes a Campus RainWorks Challenge with prize money. It is a green infrastructure design competition for American colleges and universities that seek to engage with the next generation of environmental professionals, foster a dialogue about effective stormwater management, and

showcase the environmental, economic, and social benefits of green infrastructure practices. Dr. Anandhi used the challenge approach in her class to encourage student engagement, while providing students with 'real-world' planning experience that would prepare them for the job market.

Course Learning Outcomes in both approaches

- Understand and apply the concept – greenspace in a sustainable and functional way
- Develop reflection – students will reflect on their experiences, through journaling, working in a cultural context similar (challenge approach) and different (study abroad approach) from their own
- Develop a new appreciation for human settlements
- Understand the importance of local culture and values in planning of human settlements
- Learn to think critically as planners (study abroad approach) and designers (challenge approach) to address complex planning issues
- Learn to work collaboratively in teams, in unfamiliar contexts and new clients
- Have improved written, research and graphic communication skills
- Increase student engagement in class
- Provide students with trans-disciplinary, 'real-world' problem-solving experiences
- Prepare students for the job market

Study Abroad Approach using Fair Trade Learning

Far too often, prominent agencies and institutions situated in the developed Global North countries, approach less-resourced Global South nations with ideas and ostensibly goodwill to conduct research or develop social programmes for community development. With an eagerness for short-term employment and at the offering of revenue, developing countries quickly accept these offers. However, at project's end, and as the agencies leave, the host countries are left with a document but without the human capital and training necessary to carry on the projects. The agencies, however, have gained revenue-generating knowledge and global profile to continue their work in other countries.

In light of this, Dr. Usher, a native of Belize, established the course on the idea of 'Fair Trade Learning', (Retrieved: <https://compact.org/fair-trade-learning/>). Fair Trade Learning is developed on the precepts of duality of purpose – the goals of both the students/institution and community are met; projects are community initiated and involves community-institution partnership; transparency in communication, expectations and project funding; environmental, economic and social sustainability.

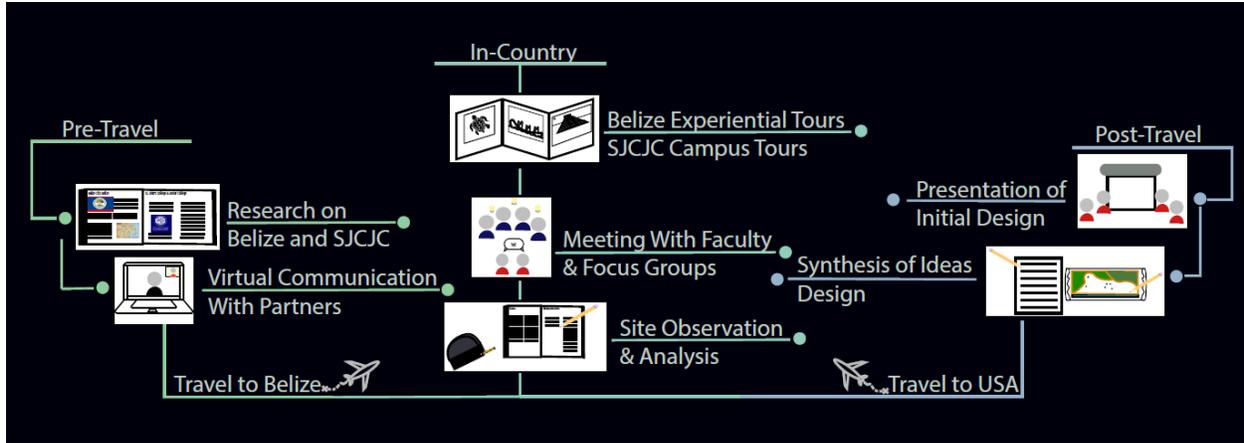
Methods

The course pedagogy was delivered in three connected formats: lecture, in-class activities and international work. Pre-travel: Students were required to read literature on fair trade learning, studied the history of the nation of Belize, spoke with clients in Belize regularly to understand conditions in the host site, and Dr. Usher brought Belize's most celebrated author, Prof. Zelma 'Zee' Edgell (Emerita) to speak with students in the class about her books on Belizean society, culture and politics. Students maintained frequent virtual communications with the Faculty of Social Sciences at SJCJC, planning professional at the BAP, and public health practitioners with the Ministry of Health. These communications centered on data gathering, development of understanding of the social, economic and environmental contexts of the work

On location in Belize (In-Country): We held meetings with SJCJC faculty and focus groups with students, healthcare administrators and public health officials (including community health workers), and neighborhood residents and businesses in the designated Belize City

neighborhood. Post-Travel: Compilation and 'sense-making' of data, data analysis, completion of planning document and presentation of design to clients in Belize.

Figure 1. Semester Itinerary



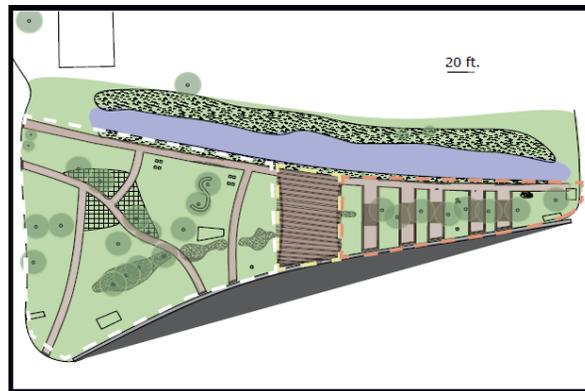
Projects

1. Mangrove Lounge: Rest and Recreation Park

Ohio State students were asked by the Social Sciences faculty and student leadership at St. John's College Junior College to design a sustainable and functional space on campus.

- To meet the needs of the students on campus while maintaining the guidelines set out by faculty to create a space to promote physical and mental health both within the student body and in the community.

Figure 2. Final Design



2. Between the Canals

Our community partner, the BAP, collaborated with the students to reimagine a once-vibrant neighborhood in the older portion of Belize City and develop a vision plan to beautify, and promote economic growth through increased community engagement that would support tourism.

Figure 3. Final Design



3. Comparing Urban and Rural Healthcare Access for Maternal and Child Health in Belize

Ohio State University students worked with the Belize Ministry of Health and the Belize Young Men's Christian Association (YMCA) on this project. The objectives were:

- (1) Assess healthcare access of urban and rural mothers in Belize
- (2) Identify main diseases affecting urban and rural areas
- (3) Quantify interactions between these groups of people, and
- (4) Discover barriers to accessing care. Overarching goals, of course, connected these objectives to suggest reforms to the Belize healthcare system.

Figure 4. Students with healthcare worker at YMCA campus



A Challenge approach

Teaching certain concepts in natural resource conservation engineering/hydrology can be challenging (Anandhi et al., 2017). Competitions and challenge prizes have a long history as a high-impact tool for mobilizing talent to find new solutions to societal problems and major technological achievements (Diaz et al., 2016). Competitions and challenges have become an increasingly popular out-of-school activity over the past century (Ali et al., 2018). The students' interest in engineering increase by demonstrating how the concepts they are learning in class

are applied in real life to engineering problems. The national and international challenges and prizes encourage teachers and students in low-resourced, minority-serving institutions to pursue these opportunities addressing real-world problems.

The Biological Systems Engineering (BSE) program, inaugurated in the Fall of 1996 at the Historically Black College/University (HBCU) Florida Agricultural and Mechanical University (FAMU), was just one of multiple efforts to increase the representation of these societal segments in engineering and agriculture. FAMU and North Carolina A&T are the only two (of 101) HBCU's that offer Biological/Agricultural Engineering in the country, with programs being ABET accredited. In this challenge approach the students learn concepts and apply them to real world problems using EPA's rainwater challenge, in master plan category.

Methods

Dr. Anandhi has been using the challenge approach to teach students about green space in her natural resource conservation engineering class (ABE 3212) since 2015. The course pedagogy was delivered in four connected formats: lecture, literature review, in-class activities (e.g. experiments, presentations) and fieldwork. EPA was considered as the client. The clients judging criteria were used to judge the students green infrastructure master plan. The criteria had the following categories: documentation, performance, resiliency, innovation and value to campus, interdisciplinary collaboration, likelihood of implementation, financial viability, community engagement, maintenance, quality of graphics, video presentation. Each of these criteria had well documented sub-criteria. The master plan category of the challenge required the student groups to present the report, a poster and a video as outputs.

Students were asked to take the "Felder-Silverman Learning Style Model" test, thereafter, were asked to share what they found with the rest of the class, if they felt comfortable. The Felder-Silverman Learning Style Model focuses on engineering students and intends to capture the key features of learning styles among them. This led to a discussion on learning style. With this information, students' learned about each other's styles and strengths, understand some of their characteristic cognitive, affective, and psychological behaviours that serve as relatively stable indicators of how students perceive, interact with, and respond to the learning environment. Then they were asked to group themselves into two working groups for project tasks.

Each student was asked to pick a green infrastructure of his or her choice, do research and come out with a one-page write-up. Each was asked to identify intensity-duration-frequency (IDF) curves for the city of Tallahassee, Florida (FAMU location). The concepts of modeling the hydrological processes were introduced in class, and problems that apply them were worked out. The two teams were asked to identify the field locations, identify the data needs and availability, and plan the green infrastructure at various locations on campus. Later, they conducted a field visit of the site in a class and presented/reformed their plans in the class. They then drafted their plan and estimations and used the award-winning entries from past years as case studies to judge, modify and improve their plan. The guest lectures from a student who competed in this challenge in a previous year provided the student groups with new perspectives. They identified new software for their work and discussed with students from diverse backgrounds. The initial draft plan was presented to faculty, staff and graduate students and their comments were incorporated as part of an exam. To encourage all students with various learning styles to participate, while being inclusive of all student ideas, each student was asked to write a three-or-more page report, that documents their contributions to each of the client's main criteria and sub-criteria. The manager in-charge of storm water at FAMU helped to further improve the groups' work. Finally, the teams presented their work to various audiences (e.g. faculty, peers, graduate students, clubs etc.).

Current Perspectives and Conclusion

Several students from the Dr. Usher's study abroad course expressed desires to return to Belize to either work on other projects or to build upon the project they completed that semester. Several students graduated from Dr. Anandhi's natural resource conservation engineering class are applying the skills and concepts they developed from the rain challenge experience in their current jobs. We can surmise that both approaches also inculcated a sense of ownership and belonging in the project beyond academic rubrics and semester grades.

Drs. Usher and Anandhi observed that in both approaches, grouping students to work on project segments, induced collaboration among groups. They noticed that although students were in groups of three to five individuals, groups would work together or individuals from multiple groups would collaborate to complete a particular task. Thus, work occurred within groups, among groups and among individuals across groups. In both the approaches, be it a foreign country or the campus they see every day, the students showed enthusiasm and engagement in learning and contribution. They were able to comprehend, communicate scientifically and thinking critically. In addition, they gained a sense of confidence in their abilities as a member of a team and found a place to belong amongst thousands at a major university. Understanding students' learning styles potentially helped instructors and students to work in a group. It allowed instructors to adapt the way(s) they teach. It allowed students to appreciate diversity, paying way to come out with novel and more balanced and effective solutions. The two approaches are effective ways to foster career interest in specific domains by helping students develop a better understanding of concepts, apply processes and procedures, acquire scientific inquiry and reasoning skills as well as develop their communication skills.

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