A Coil-Enhanced Course on International Perspectives of Climate Change

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Abstract Climate change is a complex and multifaceted issue. It is one that must concern all people and takes the work of the entire globalized world to eradicate. Consequently, a globally connected solution is paramount to sustainability. This chapter considers the potential and significance of embedding intercultural experiences and globally networked learning into courses on climate change and sustainability. In particular, the State University of New York's (SUNY) Center for Collaborative Online International Learning (COIL) has developed a pedagogical approach aimed at fostering multicultural learning across various areas of study. Drawing from our experiences participating in the COIL Center's professional development programs and through the implementation of a COIL-enhanced course, several suggestions for infusing COIL-like models into courses on climate change and sustainability are offered. To begin, a brief review of the existing literature on distance education is provided. Then, a brief background of the SUNY COIL System is presented. This is followed by a case study analysis of the COIL-enhanced course, *International Perspectives on Climate Change.* Finally, some reflections about the COIL experience at the University of Sonora are offered, including successes, challenges, and suggestions for fostering climate change literacy and sustainable learning.

Keywords Distance education · Climate change · Climate change curriculum
Intercultural experiences

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Introduction

The world is facing a large number of global challenges that requires radical modifications in the way we think and act. The United Nations, through its Global Education First Initiative, states that to achieve these desire changes, institutions of higher education must first change the way they educate because traditional models struggle to meet the global and interconnected challenges of the 21st century (UNESCO 2012). Such efforts are vitally important because they have the opportunity to influence the ways in which students engage in the world. This holds institutions of higher education responsible for the development of new ideas, new paradigms of education, and innovative ethical and sustainable solutions to these immense challenges (Cerneviciute and Petkute 2013; Holmberg et al. 2012).

Traditionally, a banking style of education has been the dominant model of pedagogy in institutions of higher education. The term, "banking education" was coined by Freire (1970), a Brazilian educator, to refer to educational pedagogy which is likened to a banking process where students store information delivered to them by a teacher. In particular, in the banking environment, a classroom is structured such that the primary objective of students is to remember and accurately recall the information provided by the teacher. They are not asked to participate in any other way, but to simply to absorb the information. In this type of approach, knowledge is static and finite and the outside world is seen as unchanging and uncomplicated. Moreover, the teacher has monopoly over knowledge. Together, the banking model of educations assumes the teacher is the narrator of knowledge and students are the passive recipients.

A banking style of education, however, is a pedagogical model incompatible with learning. It excludes diverse perspectives and privileges detachment from students. It minimizes the creative and agentic potential in them. It stifles innovation and intellectual growth. Further, it is an approach to teaching that assumes that students should merely be collectors of information that has no real connection to their lives. It masks student's ability to critically engage in and with the complexities of the world. Moreover, the banking method is a pedagogical style of education incompatible with an ever-changing, complex, globalized world. Society is experiencing changes in a fast way, therefore, everybody, but especially students must be a part of and acquire skills and knowledge to navigate this evolving present (Griffin and Care 2014; Siddiq et al. 2017). The current problems we face as a society are complex and involve many elements that interact with each other, including the environment surrounding them, producing different and new problems through feedback loops (Nuhoğlu 2010).

Taken together, traditional methods of teaching are not adequate to satisfy the new and complex challenges we face as a globe (Martin 2013). These multifaceted issues require new ways of thinking, understanding, and acquiring knowledge, in professors and students, alike (Coonan 2011). In particular, the classroom must be opened up where students and teachers together engage in dialogic enrichment through conversations, questions, debates, and inquiry. One pedagogical alternative

that has the potential to alter traditional knowledge creation is distance education. Distance education figuratively and literally opens up and changes traditional notions of the classroom. Distance education was originally designed for people unable to attend traditional schools enabling students from all walks of life and diverse backgrounds to attend school. At the core of distance education is the use of technology as a mechanism to enhance independent learning and participation from all students (Barker and Gossman 2013; Maitaouthong et al. 2011). Moreover, distance education offers a vast range of opportunities for promoting student interaction and collaboration. To date, virtual learning environments have been used in several countries, including the United States, Thailand, and Norway, starting from two decades ago (Bruce and Curson 2001).

Distance education takes many forms, but as a definition, it is a method of teaching where the student and teacher are in a remote place during the learning process and maintain communication in a variety of ways (Law and Kentnor 2015). Technologies blur the distance between students and teacher enabling students to have access to course material at any time and from any place. It can use a combination of technologies, including correspondence, audio, video, computer, and the Internet (Roffe 2004). Currently, the internet is the delivery mechanism with at least 80% of the course content delivered online (McPherson and Bacow 2015; Ospina-Delgado et al. 2016; Whitaker et al. 2016).

Online educational programs emerged in 1989 in the United States, when the University of Phoenix began using CompuServe, one of the first consumer online services (The University of Phoenix 1997). Afterwards, in 1991, the World Wide Web (Web) was unveiled and the University of Phoenix became one of the first to offer online education programs through the Internet. Nowadays, distance education is more available due to the innovations in communication technology and the connectivity of the computers and the Internet (Kentnor 2015).

According with Stankovic et al. (2015) distance education has several advantages to traditional in-person instruction. For example, distance education allows students to have 24-hour access to desired course information, providing students the opportunity to study a topic independently of space and time, eliminating spatial and temporal limitations. In addition, this kind of education reduces the costs of transportation and accommodation. In fact, online education represents the fastest growing form of distance education and it's appreciated at both traditional and non-traditional colleges and universities (Allen and Seaman 2011). Besides all of this, online education environments have been shown to improve critical thinking and stimulate student participation and collaboration. Distance education continues to grow with many universities around the world offering a large number of distance education courses on different topics with a high level of acceptance and effectiveness (Fish and Wickersham 2009).

One of the topics of high relevance to online education courses are courses in climate change literacy. Undoubtedly, climate change is one of the greatest challenges facing contemporary society (Buhaug 2016; Roberts 2016; Singh et al. 2017). In recent decades, climate change and sustainability have been present on the agenda of governments, international organizations, and even private companies.

In this same period, several large-scale sustainability initiatives have been developed (e.g., Paris Climate Agreement) in order to reduce the effects of climate change on a global scale; highlighting the environmental, societal, and economic implications of such efforts (Grittmann et al. 2017). Because of the global nature of this issue, online education stands out as one of the fundamental tools to address this problem (Nieto et al. 2012).

One factor that sets a climate change education apart from other curricula is that current and future societies are already and will continue to be affected by climate changes underway (Fahey 2012). Specifically, climate change is already causing significant harm and is growing rapidly. Its' impact on people and the environment pose serious societal challenges. As such, implementing solutions depends on an informed public. Educating future generations about the causes and effects of climate change is imperative. Likewise, the curricular discussion is not whether or not we should change the way we do things; instead the discussion is how we can do it. Distance education for climate change can allow students to inquire, question, and debate, the consequences and effects of climate change of which we are all witnesses to and are victims to from a global perspective (Dick-Forde 2013).

While courses in climate change are well suited in a distance education context, it is not without a distinct set of challenges. Climate change literacy is a complex topic to teach where many elements interact with each other. For example, from a hard-science perspective, biologic forces drive climate system variability (Wachholz et al. 2014). From a social or public health perspective, human-induced behaviors also impact the climate system. In general terms, people generally accept the hard-science perspective of climate change with a degree of certainty. However, people often resist the social interpretations about climate change; that humans are altering the climate. Prior research suggests introducing these topics with ample scaffolding and weaving tangible solutions into every discussion about climate change may be a way to reduce such resistance.

Climate change literacy also faces the challenge of obsolescence. With rapidly developing science and technology related to climate changes, research on this topic is often changing. This requires professors to keep their curricula updated (Fahey et al. 2014). If professors are not up to date with the research literature, effective delivery of a climate change curriculum can be counterproductive (Milér et al. 2012).

External factors, namely the ongoing debate about whether climate change is in fact real, poses a significant challenge to the delivery of a climate change curriculum. Some sectors of the public continue to debate the idea of climate change, despite the well-established literature stating otherwise. In addition, recent political developments in the United States suggest that climate change won't be top a priority in near future (Shear 2017; Worland 2017). On the other hand, the Mexican government has shown their support for climate change initiatives (Schmidt 2017). As analyzed by Colston and Vadjunec (2015), it is not unusual for science professors to find controversy on climate change due to political issues. Similarly, climate change literacy is also affected by socio-demographic factors and governing structures (Mycoo 2015). Dent and Dalton (2010) admitted a certain degree of

difficulty in integrating climate change issues into courses due to the fact that other topics are less complex and easier to be applied in courses. It is perhaps for this reason that Milér and Sládek (2011) suggest to increase the climate literacy of leaders first, including that of politicians, teachers, and journalists; then, educate the general public.

Taken together, an effective and innovative climate change curriculum needs a holistic approach; one that opens up the creative potential in students and takes into consideration the multiple sets of challenges as set out in The UNESCO Climate Change Initiative (2010). This means that it requires the will and ability of people to work together regardless of cultural or geographic divisions (Glasser 2009). Distance education has the potential to meet this need of creativity and innovative knowledge creation, through borderless communication and learning process. Through its multiple tools, its capacity for mass interaction, and the 24/7 availability, the goal to educate and transform lifestyles into a more sustainable one becomes achievable (Clary and Wandersee 2012; Garrison and Anderson 2011). The next sections describe a case study of a distance education course on climate change and sustainability.

Case Study: Designing a Curriculum for a Coil-Enhanced Course on International Perspectives of Climate Change

In 2016, the University of Sonora, a Mexican higher education institution, was invited by the State University of New York (SUNY) Center for Collaborative Online International Learning (COIL) to participate in the US-MEXICO Multistate COIL Program Project (MCP), which aimed at increasing inter-university collaboration between Mexican universities and American academic institutions. Beyond the main goal of this project, the program also aimed to contribute to greater cultural understanding and cross-border dialogue between students and professors in both countries.

Bachelor students at the University of Sonora are often encouraged to participate in institutional outbound mobility programs in order to gain academic credits and for their own personal growth. Although many apply for a position into the program, just a few are chosen because of economic constrains. Student participation in these programs have become even more difficult in recent years within the context of the current economic crisis. In this context, the university's authorities saw the COIL proposal as a meaningful solution for experiential multicultural learning that could supply outbound mobility opportunities to students in an affordable way. In addition, the COIL opportunity aligned with the sustainability goals of the university in that it prevented thousands of Greenhouse emissions associated with student abroad traveling.

The Rector of the university accepted the invitation to participate in the US-Mexico Multistate COIL Program Project. The course that was chosen to be *COILed* was titled, *International Perspectives of Climate Change*, taught by the

first author. This course was chosen largely because of the University of Sonora's value and commitment toward sustainability and the view that climate change is a global issue. In fact, for more than two decades, the University of Sonora has advanced climate change initiatives and has been considered an international icon of sustainability.

The SUNY COIL Center Paradigm

The SUNY Center for Collaborative Online International Learning (COIL) is one of the principal international organizations within the field of Globally Networked Learning (GNL); a type of emerging pedagogy emphasizing cross-cultural engagement experiences (Starke-Meyerring and Wilson 2008; Starke-Meyerring 2010). The SUNY COIL Center was created at SUNY Purchase in 2006. In particular, COIL developed from the grassroots efforts of a group of faculty at Purchase who were surveying ways to bring tangible international perspectives into their classrooms. Jon Rubin, the founding Director of COIL, was one of those professors. He developed a Cross-Cultural Video course where SUNY students co-produced videos over the internet with students from different countries in the world, including Turkey, Lithuania, Mexico, Belarus, and Germany.

Since then, COIL has grown exponentially with the support and recognition from agencies like the National Endowment of the Humanities (NEH), the Open Society Institute (OSI), the American Council on Education (ACE), and Banco Santander. Recently, COIL launched several large scale projects including the Steven's Initiative and US-Mexico Multistate COIL Program (MCP). The Steven's Initiative is a three-cohort project with partnerships and exchanges between SUNY and Middle Eastern and North African universities (Lebanon, Morocco, and Egypt). The first cohort resulted in 7 partnerships that reached over 350 students across 8 institutions. The MCP is a two-cohort initiative within the US-Mexico Bilateral Forum on Higher Education, Innovation and Research (FOBESII), COIL, SUNY's Office for Latin America, with the support from the USA Embassy in Mexico City and the University of LaSalle. To date, the MCP consists of 13 SUNY institutions, 4 institutions outside of New York State, and higher education institutions in 18 Mexican states. The institutional partnerships resulted in 39 courses being taught. The overall aim of the Steven's Initiative and MCP is the development of long-term COIL-based partnerships between the countries.

The COIL Classroom

COIL is not classic distance education. Instead, in the COIL model, students from different cultures register in a shared course where faculty members from each country team-teach and manage coursework. Professors' work together to generate

a shared syllabus based on the specific academic objectives of the course and discipline overlayed with some type of experiential and/or collaborative student learning. COIL classes can either be fully online or offered in more blended or hybrid arrangements with a mix of technology and traditional face-to-face-instruction. In blended or hybrid courses, the collaborative work takes place online, but the face-to-face and online activities complement and reinforce either other. To provide strong engagement to the collaborative work, in some circumstances and contingent upon funding, students from each participating institutions travel to their COIL classroom's country to meet their peers. The key to the COIL model is have the subject of the course lend itself to students working collaboratively in international groups.

In the past, courses in the Humanities, Social Sciences, Technology, and Engineering have been *COILed*. Some examples of recently developed COIL courses include: *International Development and International Migration* (SUNY Cortland and Anadolu University in Turkey), *Going Global: Intercultural Communication* (SUNY Purchase College and Universidad Iberoamericana in Mexico), *and Survey of World Cultures* (SUNY Delhi and European Humanities University in Lithuania). Accordingly, the COIL model is one that extends beyond the confines of the traditional local classroom, beyond traditional theories of pedagogy, and beyond traditional knowledge creation practices. By linking students and professors from diverse backgrounds, COIL emphasizes the value of partnered international learning environments as a tool to enhance experiential and disciplinary learning. Moreover, they also provide valuable internationally-focused professional development opportunities for faculty and participating institutions.

The COILing Process

The COIL Center has created a professional development program to support faculty as they develop their prospective courses. The COIL's Center professional development program consists of the COIL Course Orientation and the COIL Academy. A brief description of each program is elaborated below.

The first professional development program, the COIL Course Orientation is a 5-week online course that provides foundational information to prepare interested faculty members for partnering and *COILing* courses. In particular, faculty members learn more about the COIL Center, the partnering process, and create online profiles describing their prospective course. During this phase of professional development, professors also are asked to consider and discuss on discussion boards, a variety of critical issues including intercultural sensitivity, flexibility, and the significance of developing consistent protocols among partnering faculty.

At the end of the COIL Course Orientation, faculty members create profiles of their prospective course to be promoted on the COIL Networks website. The profile of that prospective course is then viewed by potential faculty partners from the Global Partner Network (GPN); a membership-based network of higher education

institutions around the world. Those interested in partnering then post replies to a profile. Once a potential collaboration has been identified, the SUNY faculty and the GPN faculty write a partnership proposal to be considered for the next stage of the professional development program, the COIL Academy.

Building upon the COIL Course Orientation, the first part of the COIL Academy is an in-person workshop usually taking place at a global partner campus. The MCP in-person workshop took place in Cuernavaca, Mexico. The in-person workshop is where partners meet face-to-face for three days of presentations, interactions with partners, and course development activities led by COIL facilitators. In addition, course outcomes are discussed and potential collaborative activities are identified and drafted with the help of COIL facilitators. More broadly, faculty partners are asked to consider their ideas more deeply and the strategies necessary for preparing and implementing a COIL course. SUNY partners also have the opportunity to visit their Mexican partner's university.

Following the in-person workshop, the final phase of the COIL Academy is an 8-week online program. This phase of professional development is where the faculty partners finalize the details of their COIL course. In particular, COIL facilitators guide partners to think deeply about what it means and how to collaborate online from the perspective of the student. By the end, partners develop a syllabus for their COIL-course including student learning outcomes, tasks, and experiential activities.

COIL-Enhanced Curriculum for International Perspectives of Climate Change

Climate change is, by nature, a global topic and is well suited for multidisciplinary and multicultural contexts, like COIL. Traditionally, courses on climate change are taught under a hard science perspective where understanding the natural phenomena associated with climate change is a core component. However, anthropogenic causes have accelerated global warming and consequently, the climate has changed. Thus, the course on *International Perspectives of Climate Change* offers students a broader analysis to climate change, one that includes the natural and anthropogenic forces.

A COIL-enhanced course on *International Perspectives of Climate Change* was thought of as an excellent opportunity to involve undergraduate students from several branches of engineering sciences from the University of Sonora in Mexico with undergraduate students from several disciplines from Nassau Community College in the United States in order to increase their awareness of the Paris Agreement goal of limiting Global Warning to well below 2 °C. Hence, the main purpose of the course was to increase students' understanding of their contributions to climate change and foster positive personal practices to reduce their carbon footprint. In addition, this course aimed to inspire students that look to deepen their knowledge about climate change for a better future.

This course was an English only spoken course at the honor-level. Hence, students who enrolled in the course had to be in excellent academic standing and have good English proficiency.

The course had the following four student learning outcomes (SLO):

SLO 1 You will be able to identify what creates climate change and what does not create climate change.
SLO 2 You will be able to express in a writing essay how you contribute to climate change.
SLO 3 You will be able to understand how you can mitigate climate change by doing a hands-on project.
SLO 4 You will be able to disseminate your findings.

The COIL-enhanced course lasted eight weeks and the entire course lasted sixteen weeks, whereby the Mexican students had the chance to exchange points of view about the weekly content with the American students. The course was a blended-style course structure where part of the content was through traditional face-to-face instruction. Interaction and collaboration with the American students took place online using several online tools.

During the first week of the course, students in Mexico and the United States were introduced to the course material including to COIL-enhanced component. The web-based learning platform called Blackboard was used to enable and support the interaction between students. Blackboard allowed students and instructors to maintain discussions boards and threads to enrich debate among students. The free software program called LiveBinders was used to upload PowerPoint presentations, papers, assignments, audios, and pictures.

During the second week, students in both countries were asked to prepare a short icebreaking video where they detailed what they expected to learn out of the course about climate change and intercultural learning. Students then met synchronously to discuss the videos and to the get to know each other more.

The third week was devoted to learning about the ABC's of climate change. This was done in students' in-person classes in both Mexico and the United States. Videos from The National Aeronautics and Space Administration (NASA), reports from the Intergovernmental Panel on Climate Change, testimonials in YouTube were used for reinforce learning and discussion.

During the fourth and fifth weeks, students learned how to calculate their carbon footprint, which is the total amount of greenhouse gases produced to directly and indirectly support human activities. This is expressed in equivalent tons of carbon dioxide (CO^2). To do this, they had to do an inventory of their daily activities, determinate the amount of energy consumed, and finally convert data to equivalent tons of CO^2. Calculations were made with the help of a web carbon footprint calculator. Students shared and discussed their results on Blackboard.

The sixth week was devoted to discussing and exploring alternatives to CO^2 offsetting. Students had to identify best practices in order to reduce their emission of greenhouse gases in order to decrease their carbon footprint. During this week, the second synchronous class occurred with the purpose of discussing the similarities and differences between student's carbon footprints in both countries.

In the final weeks, students were first asked to create a video to raise the consciousness of how undergraduate students may reduce their carbon footprint. This video was posted in student's social media. During the eight week, the final synchronous class took place with the purpose of reinforcing and discussing what students learned in class. In particular, students shared their final thoughts and ideas about what they learned. Beyond educational factors, professors highlighted cultural factors in both countries that influence the perception of climate change.

Reflections

This COIL-enhanced course started in spring 2017, yet partnership among the Mexican and the American class was not completed due to technological problems. However, the foundation to try again in future semesters have been set. The remainder of the course was taught in a traditional face-to-face instruction with the same objectives.

Despite the technological challenges, a lot was gained by the COIL model of pedagogy. Many lessons are to be drawn from this year. The main lesson being that the COIL philosophy fits well with the University of Sonora's institutional planning to offer a high standard of education mainly, in the way of offering education in a multicultural environment.

International student mobility is something that all students should take part in however, current economic situations in Mexico makes it difficult for many students. In a certain way, the COIL model allows more students to get close to the benefits of intercultural learning in a cost effective way that are usually only available by international student mobility. The potential and significance of embedding intercultural experiences and globally networked learning into courses on climate changes cannot be understated.

However, diplomatic frictions between the American and the Mexican presidents do not augur well for any type of cooperation between both countries. The continuation of COIL among Mexico and the United States could be threatened in the near future by issues like the wall, immigration, the North American Free Trade Agreement, jobs, and unfortunately by the climate change perspectives in both countries. In particular, it is may be difficult to reconcile the different diplomatic perspectives about climate change that divides the United States and Mexico. It is possible that cultural differences in views about climate change will widen further. Consequently, the need to foster climate change-literacy innovation will matter even more.

Mexican students who took the COIL-enhanced course were engaged with increasing their level of climate change knowledge to make appropriate decisions to decrease their carbon footprint. They also showed enthusiasm to exchange ideas with American students. This suggests that the provision of basic climate change

literacy to undergraduate students is an appropriate approach for helping them to learn, and pursue more complex system knowledge in the near future.

In closing, professors and students in Mexico and the United States still have a lot to learn from each other in order to keep fostering climate chance literacy and behaviors. From now onwards, the COIL framework can be the guideline for the University of Sonora and other higher education institutions to teach the basics of climate change, taking into account cultural differences to envision and create a more sustainable society.

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