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L'internationalisation à domicile : réflexion sur un projet de collaboration en ligne d'un semestre entre des étudiants canadiens et indiens

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Article abstract

In today's global community, internationalization offers students a crucial advantage by developing their intercultural competence and global citizenship skills. Recent research on Internationalization at Home (IaH) has shown that students can benefit from this approach even without travelling. There has been minimal research conducted on how internationalization affects students' attitudes towards environmental sustainability, which is another critical theme in our interconnected world. This study evaluates an IaH initiative's impact on students' environmental beliefs and values from Alberta, Canada, and Kerala, India.

As an IaH initiative, this project engaged students in online collaboration with students from a different world region. Participants worked collaboratively on four tasks and completed an individual reflection assignment. Student and faculty feedback shows that participants improved their knowledge of environmental issues and their commitment to environmental sustainability. Additionally, students also demonstrated stronger intercultural communication and global citizenship skills.

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Abstract
In today's global community, internationalization offers students a crucial advantage by developing their intercultural competence and global citizenship skills. Recent research on Internationalization at Home (IaH) has shown that students can benefit from this approach even without travelling. There has been minimal research conducted on how internationalization affects students' attitudes towards environmental sustainability, which is another critical theme in our interconnected world. This study evaluates an IaH initiative's impact on students' environmental beliefs and values from Alberta, Canada, and Kerala, India.
As an IaH initiative, this project engaged students in online collaboration with students from a different world region. Participants worked collaboratively on four tasks and completed an individual reflection assignment. Student and faculty feedback shows that participants improved their knowledge of environmental issues and their commitment to environmental sustainability. Additionally, students also demonstrated stronger intercultural communication and global citizenship skills.

Résumé
Dans la communauté mondiale d'aujourd'hui, l'internationalisation offre aux étudiants un avantage crucial en développant leurs compétences interculturelles et leurs aptitudes à la citoyenneté mondiale. Des recherches récentes sur l'Internationalisation à domicile (IàD) ont démontré que les étudiants peuvent bénéficier de cette approche même s'ils ne voyagent pas. Peu de recherches ont été menées sur la manière dont l'internationalisation affecte les attitudes des étudiants au sujet de la durabilité environnementale – un autre thème clé dans notre monde interconnecté. La présente étude évalue l'impact d'une initiative d'IàD sur les opinions et les valeurs environnementales des étudiants de l'Alberta, au Canada et du Kérala, en Inde.
En tant qu'initiative de l'IàD, ce projet a amené des étudiants à collaborer en ligne avec des étudiants d'une autre région du monde. Les participants ont travaillé de manière collaborative sur quatre tâches et ont réalisé un travail de réflexion individuelle. Les commentaires des étudiants et des professeurs démontrent que les participants ont amélioré leur connaissance des questions environnementales et leur engagement en faveur de la durabilité environnementale. En outre, les étudiants ont également fait preuve d'une meilleure communication interculturelle et de compétences en matière de citoyenneté mondiale.

Keywords: upper-division, undergraduate, environmental chemistry, collaborative/cooperative learning, intercultural competence, Canada-India, environmental sustainability, sustainable development, science

Mots-clés : division supérieure, étudiants de premier cycle, chimie environnementale, apprentissage collaboratif/coopératif, compétence interculturelle, Canada-Inde, durabilité environnementale, développement durable, science

Introduction

As the world becomes ever more interconnected, educators are responsible to equip students with the necessary skills to thrive in a culturally diverse society and an internationally collaborative workplace (Knight & Madden, 2010; Cotton et al., 2018). To succeed, postsecondary graduates require intercultural competence. This involves the ability to respectfully navigate different cultures, communicate effectively with individuals from diverse backgrounds, critically reflect on their own culture, and learn from those with differing beliefs and values. (Cotton et al., 2018; Dimitrov et al., 2014; Chun, 2011). Furthermore, learners require the knowledge, attitudes, and behaviours that enable them to address the challenges of a globalized world, which include income disparity and climate change. The importance of this requirement has increased to the extent that the United Nations (UN) has prioritized it for "all learners." In its Sustainable Development Goals for 2030, the UN emphasizes the need for enhanced education in global citizenship, which encompasses the appreciation of cultural diversity and the values of human rights and gender equality (United Nations General Assembly, 2015, p. 17). To meet this growing need for intercultural competence and global citizenship, many postsecondary educators have turned to internationalization: "the process of integrating an international, intercultural, or global dimension into the purpose, functions, or delivery of postsecondary education" (Knight, 2004, p. 11). Traditional internationalization, which involves students travelling from one place to another, can be a powerful tool in developing students' intercultural competence and global citizenship.

While it improves students' intercultural competence and global citizenship skills, traditional internationalization has notable limitations, mainly because relatively few students can participate in these programs (Deardorff, 2006; De Hei et al., p. 2019; Prieto-Flores et al., 2016). Student mobility has increased dramatically in recent years, but strained finances, travel restrictions, global pandemics (COVID-19), and immigration status difficulties can all prevent students from participating in study abroad (Knight, 2012; Custer & Tuominen, 2016). McCollum et al. investigated such barriers that present when engaging undergraduate students in online chemistry collaborative assignments; they found students were able to successfully overcome most barriers, while other "persistent barriers were identified and resolved by faculty through revisions to design and implementation" (2019). Thus, other internationalization forms have emerged under the umbrella of Internationalization at Home (IaH). IaH, according to Guimaraes et al., is the "intentional integration of an international and intercultural dimension into the formal and informal curriculum, for all students, within local/domestic learning environments" (2019, p. 90). One form of IaH—known as Internationalization of the Curriculum—involves the addition of international or intercultural components to existing courses offered in the domestic context (Cotton et al., 2018). Other IaH initiatives focus on building relationships between domestic and international students or domestic students from different ethnic backgrounds (Beelen & Jones, 2015). IaH can also take the form of Collaborative Online International Learning (COIL), which uses online education and inter-institutional collaboration to increase student awareness of culture and global issues (Ramirez, 2019). In this method of IaH, courses offer students opportunities to connect with those from different nationalities and different cultures (Júnior & Finardi, 2018).

IaH has many of the same benefits of traditional internationalization without many of the costs. To begin with, IaH has obvious practical benefits: it allows students to engage with others from hard-to-reach areas (Guimaraes et al., 2019), and it is affordable and scalable, serving many students while keeping costs low (Júnior & Finardi, 2018). One might expect that a program with reduced costs would also produce reduced benefits. However, researchers have shown highly favourable results for various IaH programs, including the online interactions involved in COIL

programs (Soria & Troisi, 2013; Hyett et al., 2018). For example, one study showed that students studying occupational therapy and oral health in Australia and Hong Kong developed critical intercultural skills through virtual intercultural activity (Hyett et al., 2018). Likewise, Ramirez (2019) analyzed a program involving online interaction between second-language learners on opposite sides of the Mexico-U.S. border and found that these students developed a greater appreciation for the other culture and "a deeper understanding of the social, educational, and economic interdependencies" of the two nations (p. 14). Lee and Cai reported on another COIL initiative, this one involving postsecondary students from Canada, Macau, China, and Hong Kong, noting that the course succeeded not only in relaying skills and knowledge but also in exposing students to different perspectives on the subject material, thus "fill[ing] a gap" in their university education (Lee & Cai, 2019, p. 381). Finally, in a review of 23 case studies, Júnior & Finardi observed that online interaction with students from other cultures helped American students develop intercultural competence by causing them to reflect on their prejudices and providing a fuller opportunity to participate in cultural, political, social, and economic dialogue (Júnior & Finardi, 2018). In short, researchers have demonstrated that IaH initiatives effectively foster cross-cultural exposure and understanding without requiring student mobility (Beelen & Jones, 2015).

To date, researchers have focused on how internationalization—and IaH, in particular—can help students develop intercultural competence and global citizenship skills. However, few have discussed the role of internationalization—especially IaH—to develop knowledge and values around environmental sustainability. This area is increasingly crucial: in fact, UN Sustainable Development Goal 4.7 emphasizes that educators must prepare students not only for global citizenship but also for environmental sustainability (United Nations General Assembly, 2015). Internationalization programs have great potential in this area, for, through international exchanges or internationalization at home, students can explore environmental issues from a global perspective, seeing the long-term and long-distance implications of environmental policy and practice. In this way, internationalization can help students develop the skills and attitudes required for environmental sustainability. This paper, then, describes and evaluates a IaH program designed to foster in students the knowledge, attitudes, and behaviours necessary for sustainable development, concluding that, indeed, the majority of students showed demonstrable gains in these areas, as well as in intercultural competence and global citizenship.

This program also had two added benefits: it engaged students from regions and fields of study with fewer internationalization opportunities. First, the project connected two world regions—Alberta, Canada, and Kerala, India—with relatively low international education engagement. A survey conducted by Universities Canada found that 96% of universities in Canada include internationalization as part of their strategic planning and that internationalization is one of the top five planning priorities for 80% of these institutions (2014a). Yet only 3.1% of Canadian students engage in an international educational experience in any given year, and, in total, just 11% participate at any point during their bachelor's degrees (Universities Canada, 2014b). Furthermore, in Alberta, internationalization is particularly low: The Alberta Graduate Outcomes Survey found that only 6% of postsecondary students participated in an international educational experience throughout their studies (Davis, 2017). Likewise, while India has strong global connections, Kerala "is highly reluctant in internationalizing higher education" (Belousova, 2019, p. 8). Second, this program involved undergraduate students in the natural sciences, thus reaching a typically less likely population to participate in international education. In terms of participation in international education, the natural sciences rank seventh: a 2016 report from the Canadian Bureau for International Education noted that business students account for 21% of outbound

international education, whereas students in the natural sciences account for only 6% (CBIE 2016). Students in the natural sciences may have fewer opportunities to develop intercultural competence, global citizenship, and environmental sustainability. As a result, this project demonstrates how IaH can extend participation in an international study to underserved groups, both in region and discipline.

Finally, instilling global competency and responsibility in students traditionally utilizes *soft* global citizenship educational tactics that can be measured through acquired and restated knowledge. Furthermore, teaching of global issues in North American institutions contain strong cultural, and specifically Western, bias, which taint students' subsequent knowledge acquisition. For example, Western-derived scientific schools of thought are considered "universal" and invariably applicable, while other international cultures contribute mere values, beliefs, or traditions (Andreotti, 2014). Instead, *critical* global citizenship arises when "a complex web of cultural and material local/global processes and contexts [are necessarily] examined and unpacked" (Andreotti, 2014, p. 41). Criticality arises when students introspect, self-critique, and refine their presupposed worldviews. The IaH project aimed to incorporate critical global citizenship education, where students were inspired to "promote change without [being told] what they should think or do, [and] by creating spaces where they are safe to analyse and experiment with other forms of seeing/thinking and being/relating to one another" (Andreotti, 2014, p. 49). This project's collaboration with a non-Western international group sought to facilitate student engagement that would promote diverse discussions of socioeconomic, historic, and political factors surrounding global, environmental issues to challenge and modify Canadian presuppositions and preconceptions. Attempting to integrate both soft and critical global citizenship skills into the internationalization project would not simply improve international relations but facilitate malleable, informed, and empathetic solutions from edified, future generations. The subsequent sections detail the (1) international partnership project methodology (international student recruitment and university partnership; project design, learning objectives, and assignments; student feedback and evaluation acquisition; data analysis methods), (2) project results according to convergent design analysis, and (3) evaluation and discussion of project learning objectives, limitations, and future IaH project considerations.

Methodology
University Partnerships
Through personal connections of the Canadian professor, a partnership was established between two universities in Kerala, India, and a private university in Alberta, Canada. This facilitated the participating undergraduate students with a graded, collaborative project.

According to the Canadian university's curriculum, students enrolled in the Bachelor of Science program are required to take four chemistry courses. Great care has been taken at the Canadian university to ensure all chemistry courses taught contain strong emphases in both green chemistry and environmental sustainability (Abraham, 2020, Abraham et al., 2020 & 2021). Because these subjects are of global importance, inevitably bringing up global policy and practice issues, the incorporation of internationalization into the course syllabus was an appropriate choice.

The Canadian institution incorporated a Collaborative Online International Learning (COIL) opportunity in a 300-level chemistry course: CHE 333 Environmental Chemistry and Sustainability Studies. This course is interdisciplinary, covering a variety of topics including waste management, microbial and aquatic chemistry, toxicology, and environmental sustainability. While the course's original curriculum contained lectures and assignments that highlighted global

issues, the addition of an international project sought to expand the course's relevance, influence, and application by facilitating intercultural interaction. Thus, students in the revised CHE 333 were challenged to transform simple knowledge of environmental issues into healthy values with personal significance. Previously, the CHE 333 course included a research capstone project worth 20% of the students' final grades. In the updated COIL CHE 333 course, the modified research project included a collaborative component between Canadian and Indian students via online interfaces.

Ideally, students from both countries would have participated in the project for credit. Unfortunately, implementation of this graded IaH project into an existing course syllabus was not feasible at either Indian college. However, the three professors in Kerala overseeing the project made provisions for the Indian college students to participate voluntarily as a part of a third-year research project.

Student Participation

In total, 28 students participated in the project. At the Canadian university, 14 students enrolled in CHE 333 and participated in COIL as a part of their course requirements. Seven students (all zoology or chemistry majors) from each college in Kerala were recruited, totaling 14 Indian students.

Project Design

The partner professors engaged in many in-person and virtual meetings to discuss how to carry out this project to maximize student interaction and collaboration. After much deliberation, the professors decided to divide the 28 students into seven groups of four, each containing two Canadian students and two Indian students (one from each of the Indian colleges).

Since the project necessitated online interfacing between students in different countries, the use of technological platforms was instrumental. The partner professors set up a Google Drive account (classrmconnect@gmail.com) where the project was introduced to the students; within the drive, each group was assigned a folder where members could store and work on documents simultaneously. Additionally, a WhatsApp group chat was created for each group for students to communicate through (instructors from each participating institution were also added as members to oversee and observe the amount of collaboration between students but did not directly communicate with the students through the chats). Due to time zone conflicts, group members interacted primarily through WhatsApp chats, but faculty encouraged students to set up video calls amidst group members to increase verbal imparting, enhance recognition of nonverbal cues, and increase intercultural communication skills.

Learning Objectives

While COIL does not facilitate in-person interactions, virtual student engagement still provides ample exposure to and opportunity for cross-cultural interrelating. Through this type of ethnic inclusiveness, the Canadian university's IaH project strove to educate three core skill sets:
- environmental sustainability,
- intercultural competence, and
- global citizenship.

While there is a degree of overlap between the three concepts listed, each skill holds distinct value. *Environmental sustainability* focuses on the natural world by examining the acute consequences of human interaction with their nonhuman surroundings. Furthermore, the attitudes and practices

underlying environmental sustainability reinforce the value of commonality when individuals recognize, appreciate, and concede how human action affects the planet at large. *Intercultural competence* refers, mainly, to the student's aptitude and confidence in cross-cultural communication. Interculturally competent individuals demonstrate cultural awareness and sensitivity, civilizational knowledge, and linguistic proficiency. *Global citizenship,* related to intercultural competence, includes having a "sense of belonging to a broader community and common humanity" (UNESCO, 2015, p. 14). However, global citizenship distinguishes itself by focusing on "political, economic, social, and cultural interdependenc[e] … between the local, the national and the global" (UNESCO, 2015, p. 14). An individual that encompasses global citizenship possesses the ability to analyze international relationships, critically consume media, and identify points of global interconnectedness (Ramirez, 2019).

To aid competency in all three learning objectives, experiential knowledge gained through interpersonal relations is imperative; therefore, students need to experience genuine, sustained cross-cultural encounters. Accordingly, the instructors incorporated learning methodologies that invoke cooperation and collaboration, namely group-learning activities. Collaborative and cooperative learning encourages positive interdependence and personal recognition of how an individual contributes to a group's common goal (Deardorff, 2006). In addition to shared knowledge acquisition, group-learning activities require students to utilize higher order thinking strategies, develop meta-cognitive dexterity, and refine social soft-skills (De Hei et al., 2016). However, to effectively achieve these benefits, group-learning activities must facilitate genuine interaction between students (Strijbos et al., 2004). Thus, collaborative learning should not merely be focused on the goal or outcome of the students' endeavours but on the quality of interaction between them (De Hei et al., 2019). For the current project, the instructors intended that, through online interactions, the students would enter into genuine dialogue, learning to navigate cultural differences respectfully. Instructors hoped to facilitate opportunities to develop robust intercultural competence, a greater sense of global citizenship, and a more profound commitment to environmental sustainability by developing five project tasks.

Project Tasks

The semester-long project consisted of five mandatory student tasks, each aligned with at least one learning objective. The first four tasks were completed within the designated groups and were assigned to encourage student acquaintance by giving them opportunities to collaborate over shared work. The first assignment focused on intercultural competence; students were required to create an introduction video that was shared with their peers. The instructors guided students to reveal meaningful information by asking them to answer specific questions regarding themselves and their surroundings. Instructors also encouraged students to provide additional information that would help their peers from the opposite country acquaint themselves with and understand their lifestyle. These videos were uploaded into their group's Google Drive folder. Although indirectly related to class content, these videos created appreciation of differences between cultures, preparing students for further intercultural contact.

The second task also incorporated cultural competence while introducing the topic of environmental sustainability. The instructors created a website (https://classroomconnect.travel.blog) containing information about the culture, food, geography, and biodiversity of both Alberta and Kerala. Students were prompted to read through the website and identify five novel facts about their non-native country and one about their homeland. Students then shared these observations with their group members on WhatsApp. This task encouraged

further relationship-building and increased students' awareness of the other region's unique ecological attributes.

The third and fourth tasks, which comprised the majority of the research project, focused heavily on global citizenship and environmental sustainability, establishing critical thinking and a sense of universal cohesion (Marginson & Sawir, 2011). In their respective groups, students chose one of seven topics to investigate:

- renewable energy,
- plastic waste management,
- potable water sustainability,
- application of mycorrhizae in sustainable agriculture,
- biopesticides,
- biofertilizers,
- or epidemics.

Each topic was carefully chosen to illustrate how issues vary between geographic regions and to facilitate understanding of the issues' integration across the globe. In addition, students were encouraged to investigate interrelated political, economic, and cultural contexts for each chosen issue. After choosing a topic, students first compiled their research on a single Google Document where they could simultaneously edit and revise the same file. The students worked together to submit a proposal for a final PowerPoint presentation. This proposal outlined relevant scholarly research as well as a potential schematic of their presentation. This activity helped ensure that the students both understood the necessary elements of a presentation and gathered sufficient information. The group members then collaboratively created a well-designed PowerPoint presentation incorporating instructor feedback from their proposal and rough-copy presentation draft. The presentations were evaluated on general content as well as cohesion and professionalism of their work. To successfully accomplish a high caliber presentation, frequent communication on WhatsApp, video and voice calls of the group members was essential.

The fourth task required each group to create a 20-minute video presentation about their chosen topic. Students were free to present their information creatively but were encouraged to maintain an appropriate level of professionalism (e.g., podcast or interview format). Each group member was expected to appear and speak in the presentation. This project necessitated diligent collaboration, as group members had to plan the optimal way to divide the content and integrate this material back into a cohesive whole. Most groups utilized their PowerPoint slides with audio narration and periodic video excerpts, where students spoke in greater depth about their particular issue. Other groups employed an interview-style video where students held dialogue with one another about their group topic. These final video presentations were recorded and uploaded to Google Drive for evaluation and for the rest of the students participating in the IaH project to access and watch.

Student Feedback

The final and fifth task was to submit a written reflection that summarized the students' international experiences. Students were asked to comment on the benefits, challenges, and main takeaways of the project. Excerpts from these reflections will also appear in the discussion. The formal, contemplative assignment was completed by the Canadian students only; however, Keralan students did voluntarily provide anecdotal responses that have been included in Table 3 and the discussion.

In addition, students from Alberta completed a closed-ended questionnaire on a Likert scale, created by the Canadian professor based upon IaH learning outcomes. Students completed the task anonymously during class time using Google Form and earned a completion mark worth 3% of each student's grade. Because the Canadian instructor utilized a simple completion grading scheme, they could accept responses anonymously. Table 1 summarizes the results of the questionnaire responses.

Student Evaluation
This final research project contributed 20% of the Canadian students' overall grade. For each task, students were given clear instructions so that they could tailor their work to meet the desired learning objective. A rubric for the third and fourth tasks (Figure 1) helped ensure that the students would enter the project with a collaborative mindset. Instructors also provided formative feedback throughout the process so that the students would not merely look at each grade and move on but learn to integrate improvements into the next piece of the project.

IaH Evaluation
To evaluate the effectiveness of this collaborative project, feedback from participating students and faculty was collected. Because of the discrepancy between the two country's class curriculums (credited work for Canadian students vs. a volunteer project for Indian students), it was not possible to receive equivalent feedback from the two participating student bodies. Qualitative and quantitative data was obtained from the Canadian students using the aforementioned questionnaire along with an end-of-semester anonymous course evaluation survey. Since participation from the Keralan students was on a volunteer basis, qualitative and quantitative feedback was not collected. However, a few qualitative statements were colloquially received through the WhatsApp messenger (Table 3). Thus, the following results are derived from primarily Canadian student feedback.

In addition, the IaH project was analyzed via a conceptual framework; namely through Vanessa Andreotti's "soft vs critical global citizenship" theoretical framework (Andreotti, 2014). Similarly, qualitative feedback was scrutinized to determine if students pushed beyond traditional soft global citizenship educational goals towards criticality.

Data Analysis
A simplified convergent design was utilized to analyze the data collected from both the IaH questionnaire and course evaluation (Bartholomew & Lockard, 2018). Two stages are implemented in this convergent design: The first stage of the project analysis included independent collection, recording, and interpretation of both the quantitative and qualitative data. Specifically, quantitative data from the questionnaire was combed for trends in student's numerical responses along with the identification of any outliers. Similarly, the qualitative data was analyzed to look for recurring themes and/or patterns of phrasing. The second stage merged the qualitative and quantitative data to compare and contrast content or feedback that was present in the two data sets. This final stage required meticulous interpretation of the merged data, which provided insight and understanding of the students' experiences, illustrated clear advantages and barriers to student success, indicated which project objectives were achieved and demonstrated by students, and revealed necessary modifications of future IaH projects.

Figure 1

Rubric for Project Work and Presentation

Criteria	Weight	Excellent	Adequate	Approaches Expectations	Needs Improvement
Teamwork	50	The group worked very well with each other and the presentation was shared equally among the group members.	The group worked well with each and communicated well. Some members participated slightly more than others.	The group communicated relatively well with a few lapses in the presentation; some students dominated the presentation and others did not participate much.	The group did not work well together. There were obvious miscommunications and lapses in the presentation.
Content/design/ visual appeal	25	The group demonstrates an in-depth understanding of the topic, accurately utilized, researched information from the paper, and used images to make the presentation "come alive". The design of the PPT is excellent: attractive, neat and enabling smooth flow of information.	The group demonstrates an understanding of the topic, employed research information with an adequate degree of accuracy, and used an adequate amount of images to present the content. The design of the PPT is excellent: attractive, neat, and enabling smooth flow of information.	Demonstrates little understanding of the topic. Employs research information with a fair degree of accuracy. Poor selection of images. The PPT design is acceptable, though would have been improved with more attention to detail.	The group lacked understanding of topic and only reported the most basic parts of the information. Graphics do not tie in with the content. The PPT is distractingly messy or unorganized.
Kerala and Canadian context	20	Issues that are relevant to Kerala and Canadian context are described. Current examples are provided.	Kerala and Canadian context are addressed and examples are given.	Kerala and Canadian context are acknowledged, however missing some key points and examples.	Kerala and Canadian context are not sufficiently addressed, no examples provided.

Results

Stage 1A: Quantitative Data Summary

After examining the quantitative responses in Table 1 via trend analysis, the most highly agreed (> 95% of responses fell into the "strongly agree" or "agree" category) statements included those that discussed: increased comfort with virtual, international communication, social skill enhancement with persons of differing cultures, elevated humility with regards to learning from other cultural perspectives, and greater acceptance of differences arising from cultural factors. It is also significant to note that none of the statements provided in Table 1 prompted disagreement critical literacy from students, as agreement with these questions requires "skills of critical engagement and reflexivity" (Andreotti, 2014, p. 49).

Table 1

Likert Scale Questionnaire Results, as Part of the Student Self-Reflection Assignment. Statements are Derived to Incorporate all Three Learning Objectives of the Project: Intercultural Competence, Global Citizenship, and Environmental Sustainability

Participating in this project …	Strongly agree	Agree	Somewhat agree	Disagree
enhanced my knowledge of global issues	64.3%	25%	10.7%	0%
increased my awareness of current research and trends related to the subject matter	39.3%	46.4%	14.3%	0%
increased my comfort with technologies that enable communication with people in other countries	78.6%	17.8%	3.6%	0%
enabled me to be more flexible and adaptive in working with other cultures	45.7%	40.0%	14.3%	0%
improved my ability to communicate with people from other cultures	67.8%	28.6%	3.6%	0%
increased my willingness to learn from people of other cultures	75.0%	25.0%	0%	0%
increased my acceptance of cultural differences	78.6%	17.8%	3.6%	0%
increased my skills in working with people from other cultures	32.1%	39.3%	28.6%	0%
increased my knowledge of other cultures	53.6%	35.7%	10.7%	0%
increased my understanding of other cultures (i.e., beliefs, values, perspectives, and practices)	39.3%	35.7%	25.0%	0%
increased my understanding of how other cultures approach academics	28.6%	35.7%	35.7%	0%

Stage 1B: Qualitative Data Summary

Independent review of the qualitative comments gathered from the anonymous course evaluation (see Table 2) were thematically analyzed. Three prominent concepts emerged from the students: the project was a novel and appreciated experience, extensive learning was uncontested, and challenges that presented themselves were not debilitating but confronted. The comments listed in Table 2 are all comments received from the end-of-semester course evaluation. Other qualitative comments from the students were embedded within their personal reflection assignment. Comments found in the reflection assignment were overwhelmingly positive, and any despondent remarks corresponded to the logistic or linguistic challenges students faced.

Remarks from Table 2 and Table 3 supply anecdotal evidence of developing global citizenship amongst both Canadian and Indian students, as many commented on the value of learning about and working with cultures beyond their fellow peers.

Stage 2: Interpretation of Merged Quantitative and Qualitative Data

Through contrast analysis and comparison of the qualitative and quantitative data, a few important commonalities were identified. Namely, increased *confidence* and willingness to learn from, work with, and communicate with other cultures, *enhanced knowledge* of global issues previously not known, *learned* appreciation of other cultures and their collaborative contributions. In general, the merged data suggests students were actively invested, interested, and motivated by this IaH project.

Discussion

Overall, the IaH project between Canadian and Indian students was exceptionally positive, with students from both regions remarking that their experiences were valuable and gratifying. The instructors were satisfied to see a great deal of interaction between the students, witnessing personal friendships develop alongside professional, academic relations. Moreover, anonymous Canadian student feedback and excerpts from personal reflection assignments indicated that the IaH collaboration had not only achieved the learning objectives in participating students, but successfully evidenced critical, in addition to soft, global citizenship skills emerging because of such intercultural relations.

Table 2

All Student Comments From CHE 333 End-Of-Semester Course Evaluation

There were higher-impact teaching practices brought into the class through our international classroom project.
The international project was the best part of the course. It was a great experience and taught me a lot.
The international aspect was excellent. I loved learning about Kerala and speaking to our partners overseas.
Learning the differences in other countries and their use of renewable resources.
The international project was an excellent experience in the end that broadened my perspective in science.
International classroom project: this was exceptionally enjoyable. However, the amount of communication required in the course caused many struggles between the students in Alberta and in Kerala. The 'video presentation' component was enjoyable but was challenging due to the limitations of technology and time zones.
It was my first time working on a project with another country, and I enjoyed the experience.

Table 3

Keralan Voluntary Student Feedback From CHE 333 Collaborative Project

It was my first experience with a classroom room across the world, I was so excited to do this case study. And I got an opportunity to understand the cultural differences. This case study gave me an ability to manage both communication and other environmental knowledge beyond my limits.
Participating in this project help us to aware more about the problem faced by Indians by the use of plastic. From this project I found that not only India but also the rest of the world. There are a lot of problems faced by the use of plastic in both Alberta and Kerala. Our group experienced some difficulties during the project such as internet problem, time differences, exam during the project days etc. So, we got less time to enjoy the project but whatever we worked lot for this case study. Professor Liza help us a lot. I thanked Liza for gave me such an opportunity to work across the world.
This is the first time I am participating in an international project. Initially I had fear, I was wondering about my language skill. However, the Canadian students made me very comfortable in my conversations. We discussed about Kerala food and Kerala festivals. This information came to me in surprise recognizing that there are lots of work and research happening in the area of biopesticides in my own country and especially in Kerala.
I enjoyed doing the international project. The Canadian students were friendly even though we struggled a lot in finding the time that works for all of us. I found out that we have more epidemics in Kerala than Alberta. We learned that Albertans deal with seasonal flu while we have many epidemics.
It was great to work with Canadian students. Our topic was potable water sustainability. Though our discussions and research we found out that even though Kerala is plentiful in water, we still struggle with potable water. This is not a problem to our group in Canada.

Environmental Sustainability: The opportunity for cross-cultural exposure affected students' perspectives on environmental sustainability by raising awareness of environmental issues and inspiring their commitment to resolve them for the good of all. The Indian students, especially, expressed their excitement to learn about environmental issues beyond India. This type of international content was novel to them, and the international students described themselves as "more aware" of prominent issues such as plastic waste/disposal, reliance on nonrenewable energy sources, diseases and epidemics, potable water availability, and greenhouse-gas emissions. They remarked on their realized significance of these environmental concerns that will undoubtedly "not only [affect] India but also the rest of the world." Canadian students also noted the ways their perspective on environmental sustainability had grown; one said,

> India is currently the number one source of greenhouse gas emissions due to its heavy reliance on coal. This is a significant problem for both India and the rest of the world. . . . The government has taken many steps to ensure their policies are becoming more efficient in terms of utilizing these resources and replacing the previous reliance on coal. Before participating in this project, I was completely unaware of how serious the situation was and how significant the need for change was.

Likewise, another Canadian student observed that awareness of environmental issues in Kerala "changed [his/her] understanding of the urgency needed to get rid of single-use plastics." Many students, demonstrated by the written reflections in their final fifth assignment, gained respect for the gravity of environmental issues when they saw the detrimental global effects. Additionally, other students were inspired by India's progressive environmental endeavours, commenting that their research interested them to explore and implement "alternative options" in Canada.

Intercultural Competence: For all students, Albertan and Keralan, communication was a vital component for successful completion of the project, and both student bodies appreciated the opportunity to improve their skills in this area. From the quantitative data analysis, the vast majority (96.4%) of students not only agreed, or strongly agreed, that the project either increased their ability to communicate with other cultures, but all students reported an increased respect for and willingness to learn from people with varying international perspectives.

For the Indian students, specifically, the challenge was linguistic. While Canadian students spoke in their first language, Indian students continually translated and worked within the constraints of their second language skills. Though well versed in casual, conversational English, some Indian students faced challenges in utilizing English for academic purposes. It is important to note the difference in linguistic ability between the two Indian schools that participated in the IaH project; one Indian school was located city-centre while the other was located in a more remote, rural setting. Students from the central school felt better equipped to converse in English. Conversely, students from the rural school felt speaking English fluently was a greater challenge. One such Indian student remarked that he was "pushed beyond [his] limits" in his ability to communicate in English with Canadian counterparts. Unfortunately, this limitation affected the student's ability to build deeper relationships and likely resulted in an intellectual underrepresentation regarding his academic topic. In future collaborations, special considerations should be taken to evenly distribute linguistic ability amongst student groups so that each member may benefit to the greatest degree. Nevertheless, many other Indian students commented that they "enjoyed and benefited from the challenge of practicing [their] English."

The Albertan students also experienced communication challenges, but these struggles focused more on the technological and organizational barriers to communication. For example, one Canadian student reported that some group members lacked consistent internet and phone access, making "communication less enjoyable and much harder." Generally, Canadian students felt they were "pushed out of [their] comfort-zone" to navigate group work within an online project, especially in an international context. But these students demonstrated organization and resilience, as participants employed communication and planning to arrange group meetings, delegate and divide specific tasks, and produce detailed, cohesive work. Students also learned to utilize virtual platforms that would enable greater flexibility amongst international group members. One Canadian student expressed appreciation for "learning how to use WhatsApp and Skype to communicate," noting he planned to use those virtual tools for future communication. Though challenging, Canadian students recognized that the opportunity to interact with their Indian peers "provided numerous benefits" and further commented that the logistic difficulties they faced "were not too serious" to be overcome.

To effectively communicate and collaborate successfully across different time zones, both Canadian and Indian students practised cultural acclimation, sensitivity, and appreciation. Both country's students commented on the difficulty of communicating across an 11.5-hour time difference, but they learned to "accommodate one another," realizing that "communication between countries is not only available but extremely useful," manageable, and enjoyable. One Canadian student stated: "The success and the struggles we had with the project trained me to be more flexible and adaptive" in international relations, while another commented on the expansion of their "knowledge of communicating with other countries with such a large time difference."

Several students stated that the course's research project enabled them to better "understand and accept cultural differences." For example, Canadian students discovered, over the course of the semester, differences in Indian holidays. The students enjoyed the opportunity to

observe dissimilarities between Canadian and Indian festivals and "the fashion in which [they were celebrated]." Moreover, Canadian students adapted plans to accommodate their peers' needs, as the Indian students' festivals affected their group timelines. Thus, time and schedule barriers enabled students to confront intercontinental communication challenges while adapting to and appreciating other cultural commitments.

Global Citizenship: Both student populations felt they acquired knowledge about global issues (especially those pertaining to India and Canada) with heightened recognition of their personal membership in a global community. This is specifically evidenced by the merged qualitative and quantitative data that revealed congruities of, predominantly, Canadian students expressing enhanced, modified, and informed understanding of issues occurring globally. Additionally, Canadian students frequently admitted to a lack of previous knowledge surrounding environmental, legislative, cultural, and public health concerns that affected their Indian counterparts. Throughout the IaH project, students were exposed to issues affecting their local and national societies and were subsequently asked to explore how/why these common affairs persist differently throughout "the rest of the world." One Canadian student reflected,

> This project really opened my eyes to other global issues that are occurring. Sometimes, it is very easy to get caught up with what is happening in our own country and forget that other countries have struggles of their own, often more devastating than our own country. Experiencing what is going on in other countries from our own was a great experience in expanding our knowledge and care for global issues that do not just involve Canada.

It is encouraging to witness students develop characteristics of global citizenship in response to the IaH project, as they demonstrate a desire to engage with international media coverage, understand the global impact of local decision-making, and become inspired to invest, time or otherwise, into global affairs.

Critical and Soft Global Citizenship Skills: It is important to express the difficulty of facilitating and developing critical global citizenship skills within school curricula. International studies and projects commonly facilitate knowledge acquisition and enhance students' soft global citizenship skills, which should not be undervalued. However, creating international opportunities for students that overtly demonstrate students' global citizenship criticality in either action, disposition, or capacity is challenging. In the IaH project, all questions in the student feedback questionnaire notably demonstrate the acquisition of soft global citizenship skills: identification of issues beyond native borders, improved collaboration and communication with international partners, and acceptance of diverse opinions or perspectives when solving problems. Additionally, without equal responses from the Keralan students, in both quantifiable and qualitative forms, it is untenable to claim critical global citizenship skill development, as we wish not to centre on the experiences of Canadian learners solely.

However, there are notable responses from both the quantitative Likert scale results and the qualitative reflection assignments that we believe demonstrate *developing* criticality from the Canadian students. For instance, Albertan students observed distinct differences in how their Indian counterparts pursued their academic studies. One student noted:

> As our group continued to work on our project, it became evident to me that our approaches to academics were quite distinct from one another. … I was primarily focused on completing the project before the deadline in order to ensure it was done to a high standard. However, it appeared

that India's students had a different primary focus; it seemed as though their priority was to build a connection and a relationship before beginning the work.

This Albertan student has demonstrated both an instilled value of goal-orientated project completion and a proclivity to work independently on scholastic endeavours (collaborating only when directed or voluntarily with pre-established friendships). This attitude is reflective of a, generally, individualistic (Ma et al., 2020) Canadian society. On the other hand, the Keralan counterpart presented a relationship-centred mindset when undergoing the group project. Again, this is reflective of the collectivist society (Ma et al., 2020), prevalent in India, that promotes interdependence and societal cohesion. The same student later remarked that recognizing these differing approaches would aid future international collaborations and improve group communication and effectiveness. By evaluating different approaches to group work, the student did not identify one method as "right" and the other "wrong," but instead took space to "reflect on their context" and consider "their own and others' epistemological and ontological assumptions" (Andreotti, 2014, p. 49). Though the student may not yet possess the depth of understanding as to why these variations in group-work goals exist (individualistic Canadian vs. collectivist Indian societal norms), this student's ability to identify cultural variability in group dynamics, understand societal influences, and vocalize future strategies for intercultural partnership reveals an acute example of growth towards critical global citizenship skill.

Many other Canadian peers, too, observed dissimilarities in cultural approach during their IaH projects. These observations required students to become aware of their own potential biases, perspectives, and Canadian normalcies. Then, students must acknowledge how these presuppositions have influenced their research, conversations, and consensuses. Interestingly, one student shared that after noticing the international variances, it "created a desire within [her/him] to work on adopting some of these cultural differences into [his/her] own life here in Canada." Another recognized there are "numerous different ways one single thing can be looked at, explained, and understood." The Albertans vocalized how their "differences served to help contribute new perspectives and viewpoints" within their projects. Multiple students emphasized an increased "willingness to learn from people of other cultures." the importance of "hum[ility]," and the invaluable realization that "*your own experience is limited.*" Certainly, Canadian learners gained insight into cultural divergence, demonstrated learned value for international counterparts, and critiqued "relationships among perspectives, language, power, social groups and social practices" (Andreotti, 2014, p. 49).

Furthermore, during their IaH projects, students researched what economic limitations, technological advancement restrictions, or governing body guidelines are currently contributing to the global issues that are variably faced in each nation. They, consequently, gleaned insight into the impact of legislative restrictions and/or challenges imposed upon their appointed environmental topic (renewable energy, plastic waste management, potable water sustainability, application of mycorrhizae in sustainable agriculture, biopesticides, biofertilizers, or epidemics). Resultantly, many students noted that, by the end of the semester, they began paying ongoing attention to "the actions [of] other governments" beyond Canadian parliament. The IaH collaborative research projects revealed to students the complexity of each global issue and their multifaceted, contributing factors. Solutions to global environmental issues will, thus, be complicated in response, as there is no "universal recipe or approach that will serve all contexts" (Andreotti, 2014, p.49). One student vocalized this specific sentiment, stating: "students expressed their concerns, interests, and opinions and this allowed me to realize the numerous different ways one single thing can be looked at, explained, and understood."

Overall, student feedback was positive, and the authors feel that this project was a valuable experience for those involved. Based upon the convergent data and theoretical framework analysis, primarily derived from primarily Canadian student feedback, we assert that opportunities to collaborate with students from varying countries and cultures effectively challenge students to establish meaningful and productive international, academic relationships. This international collaboration facilitated students of the natural sciences to broaden their cultural competence through flexibility and understanding, gain a stronger sense of their participation in a global community, and develop their beliefs and values surrounding environmental sustainability.

Instructors

Throughout this project, the instructors collaborated extensively. In the planning stage, they collaboratively created the assignments and class website. Later, the instructors from each of the three institutions were heavily involved in the day-to-day management of the international project: they helped students troubleshoot technology programs, guided students through the assigned tasks, and, of course, graded student submissions. To assess this project's value for the instructors, all faculty participants completed a brief, anonymous survey on their experience. The survey invited faculty to reflect not only on their students' progress but also on the benefits of their work as instructors and researchers.

Regarding student progress, participating faculty observed that the five learning tasks produced great engagement between students, encouraging conversation about personal, cultural, and academic matters. While completing the first two tasks, students became excited to meet and find out about one another's countries. By encouraging them to share about their lives, the introduction video and blog website created comfortability for students to relate interpersonally, replacing the superficiality that can often accompany collaborative group work. Students enthusiastically participated in these projects, both in learning about a new country and sharing information about their own. The third and fourth tasks stimulated frequent and extensive interaction between the students, which aided them across cultural barriers such as conversing with those who speak English as a second language, incorporating alternative and global perspectives on environmental topics, and learning to withhold judgment of cultural differences while working towards a common goal.

Instructors reported high personal satisfaction. By working with their respective international partners, the project gave each of the three instructors the opportunity to profile their expertise in environmental chemistry and sustainability studies at their institutions. Moreover, the collaborating instructors developed a strong professional relationship and even planned to continue working together on a future long-term collaborative research project.

Recognition

The IaH project was recognized as the "The Grant Successful Project" by MacEwan International in 2019, and as one of the successfully funded projects, the Canadian professor was invited by Campus Alberta to present the international student collaboration at the online forum event. The event was attended by the director of International Education and Ministry Alberta, amongst other important attendees.

Barriers and Limitations

The first barrier to success was organizational: though the international project was a component of CHE 333 at the Canadian University, the Kerala colleges did not have the freedom to

incorporate the IaH project into an existing course. Thus, the students from Kerala participated in the project voluntarily rather than as a required course component. The instructors from Kerala worked around the issue by allowing students to participate as part of their final-year degree project. Because of this arrangement, enough students from Kerala were recruited. However, it would be more beneficial for entire classes from the Kerala institutions to participate so that students could more easily earn credit for their participation and commitment to such a project. In this respect, further COIL initiatives would benefit from G. Akcayir and M. Akcayir's work on the flipped classroom (2018).

A second barrier encountered was the ~12-hour time difference between the two countries. Because of the large time discrepancy between countries, students had to connect with their international classmates either early in the morning or late at night. However, both the Albertan and Indian students overcame this barrier to complete their work and reported that they ultimately benefited from the experience.

The third limitation is consequential because of the inadequate data collected by the Keralan students. In this review, our takeaways are generalized among the two international groups of students. Due to organizational constraints, the same qualitative and quantitative data collected from the Canadian students could not be replicated from the Indian undergraduates; thus, our printed data mainly speaks to the perspective of the Canadian students. We, the authors, recognize the importance of robust and inclusive data that can provide unbiased results. While understanding the limited comments from the Keralan students were not given the same attention or analysis as the Canadians, we felt inclusion of the limited data was important, nonetheless. In future explorations of IaH projects, a larger scale of participants would contribute to complete data sets, providing a more statistically meaningful report on student experience and benefit.

Finally, while this paper presents a preliminary review of an internationalization at home, there is much to be explored in the realm of connecting students across the globe to increase intercultural competency, global citizenship, and environmental sustainability. If possible, further implementation of internationalization, via a project of similar nature, would benefit from a more organized approach to both qualitative and quantitative data collection and would, subsequently, provide an equal presentation of data from both countries.

Conclusion
Feedback from both instructors and students suggests that involvement in this initiative resulted in the development of positive skills and attitudes related to environmental sustainability, intercultural competence, and global citizenship. Through a semester-long engagement with international partners, students from Alberta and Kerala expanded their comfort zone, thereby improving their capacity to adjust to and interact with peers from a different culture. The students uncovered significant variations between personal, social, and academic environments in another country, and as a result, gained an appreciation for the value of diverse perspectives. Moreover, as students became more aware of international issues, they also gained a better understanding of their role in and responsibility towards the global community. As a result of exploring global environmental issues, students not only deepened their understanding of green and environmental chemistry but also gained a strong appreciation for environmental sustainability. Qualitative and quantitative feedback derived from this project suggest that internationalization can contribute and facilitate all three learning objectives.

Because this project utilized online interaction, students gained these benefits while remaining in their native country, significantly eliminating expenses, and minimizing disease

exposure risks that would otherwise accompany international travel. The study highlights the significance and practicality of IaH for science disciplines. The IaH project not only promoted internationalization among students, faculty, and participating institutions but also fostered an appreciation of international perspectives on critical environmental issues in global society. Thus, this project provides evidence for valuable implementation of IaH collaborative opportunities and prompts the engagement of education faculty to promote like-minded projects that will inevitably contribute to an interconnected global community.

This project can inspire other educators working in the natural sciences, regardless of school amplitude. Since this project involved small institutions with limited internationalization, it expanded the scope of their international programming. This project can serve as a model for educators in the sciences who see the value of international education but have few opportunities to build study abroad into their programs. Often smaller educational establishments, such as those in Alberta, Canada, and Kerala, India, are not equipped with dedicated funding or in-house departments that may organize such international connections. This successful project was initiated, planned, and established via personal networking connections, demonstrating there are always opportunities for smaller universities to embark on international collaboration. Moreover, participating faculty personally benefited from this project's international reach, as they solidified connections for further research in their fields. The participating instructors and institutions currently plan to pursue similar projects in the future and hope that their efforts can inspire others.

The collaboration between Canadian and Indian students offered a way for students to cultivate their competency in global citizenship. The project's three learning objectives (environmental sustainability, intercultural competence, and global citizenship) were meant to invoke critical global citizenship skills and humble, inquisitive learning attitudes that would both facilitate genuine student engagement while exemplifying practical experience of international collaboration on large-scale issues. Though demonstration of global citizenship at a *critical* level was not attainable for our IaH project, many soft global citizenship skills were confidently exhibited. Speaking directly with, accommodating to, and collaborating amongst students of another nation enabled not only knowledge of global issues to emerge, but humility, understanding, and cultural appreciation when tackling such global crises. Through the IaH project, students gained comprehensive, culturally diverse expertise on global issues, developed empathy, understanding, and respect for ethnic variability, and were inspired to assume responsibility for environmentally sustainable life choices.

Ethics
The Research Ethics Board from the Canadian university concluded that the current project is ethics exempt.

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