



REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

THE PRACTICE OF COIL (COLLABORATIVE ONLINE INTERNATIONAL LEARNING) IN BRAZIL: A CASE STUDY ON THE PRACTICE OF SUSTAINABLE DEVELOPMENT IN THE ACADEMIC ENVIRONMENT

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Recibido el 8 de noviembre de 2023. Aceptado el 6 de mayo de 2024

Abstract

Recently, the educational system of the planet has been going through several expressive transformations. Examples include the change in the curriculum, the innovation of strategic methodologies for obtaining knowledge and especially the new remote teaching methods arising from the impacts of the COVID-19 pandemic. This study aims to present the teaching methodology of inverted class used in the discipline of Environmental Sustainability Applied to Engineering, promoted by the Federal University of Pernambuco (UFPE), at the Academic Campus of Agreste (CAA). This discipline proposes to create a collaboration network model, with national and international partnerships, for the broad teaching of environmental education. In this discipline, cultural exchanges, learning about the concept of sustainability, development of sustainable projects and understanding of the situation of environmental resources on the planet are promoted. Adopting an innovative and practical teaching methodology, with the presence of strong aggregating partnerships, it can be observed that there is a greater contribution to the dissemination of the concept of sustainability linked to environmental conservation for future generations. The entire course is based on the concept of thinking globally and acting locally.

Keywords: educational system, methodology of inverted class, environmental sustainability applied to engineering, environmental education.

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Introduction

Almost all aspects of current everyday life are influenced by new information and communication technologies (NICTs) (Castro *et al.*, 2019). As a result, higher education institutions (HEIs) and educators are faced with the need to adapt teaching-learning methods to meet the demands of today's society. Technological innovations have not only increased access to online education (e.g. Finardi & Tyler, 2015), but also allowed for a more personalized approach to teaching and learning. In this way, NICTs have become increasingly present elements in educational institutions, as it is evident the need for higher education institutions to form digitally and interculturally competent citizens to navigate global oceans and local seas. We live in an increasingly interconnected world where the boundary between the global/local is porous in what could best be described as global issues (Piccin & Finardi, 2019a; Patel & Lynch, 2013).

The increasing complexity of NICTs has made people increasingly connected with other individuals from geographically and culturally distant locations. Thus, HEIs are being challenged to create learning environments that integrate the communicative tools and practices present in this new reality/society. The culturally diverse university community becomes globally and locally relevant, enabling intercultural awareness through contact with various perspectives and worldviews. HEIs have the task of preparing citizens to actively participate in this intercultural world, and the internationalization of higher education plays an important role in this process.

Many scholars note that “information, knowledge and innovations, as well as ways of their practical application, are increasingly considered as a source of profit in a post-industrial society” (Ussenova *et al.*, 2020). According to British scholars Bridges and Bridges (2017); Menzies and Baron (2014), “transnational education refers to all types of higher education programs, complexes of educational courses or educational services, dual enrolment opportunities, summer bridge programs and team projects”. Such programs can be provided by a country's educational system or may be independent of any systems at all. International students' exchange may be studied theoretically and applied practically. According to different research's meta-analysis, the main problems of students' exchange are the institutionalization of international education and management of students' needs, psychological and social support shapes and structure, and the transition from the national to international. Thus, “research focuses on the methods of internationalization at the individual, institutional, and national levels” (Bedenlier *et al.* 2018, p.108).

Global Citizenship Education (GCE) has been used as a catchphrase and umbrella term by researchers, educators and national/international education stakeholders to refer to the context of internationalization of education (in various levels) and its relation to globalization and citizenship. The concept of GCE can be traced back to the 1980s (Cantón & Garcia, 2018), when the United Nations (UN) Commission on Environment and Development defined “sustainable development” as meeting present needs without compromising the resources of generations future, considering aspects such

as economic growth, social inclusion, governance and environmental sustainability. At the 2015 UN summit, seventeen sustainable development goals (SDGs) were presented with 169 targets, which were then included in the 2030 agenda for sustainable development.

The legitimacy and relevance of Higher Education Institutions (HEIs) and GCE, in terms of their roles and responsibility to address society's wicked problems, have been in the spotlight, since the Covid-19 outbreak. The legitimacy/relevance crises of higher education, fueled by the pandemic, have offered a unique opportunity for HEIs to put their dysfunctional strategies behind, reviewing their mission to offer more community outreach and internationalized teaching, research, and services (Santos & de Almeida Filho, 2012). One can cite as dysfunctional education strategies the fact that higher education generates middle and upper class citizens who obtain greater benefits than those from the lower class (Rashid, 2016).

Another vital example of the higher education dysfunction experienced in so-called "one of the most developed nations in the world", the United States, explains David Brooks (2005) is how economic circumstances affect one's educational opportunities in the United States, stating that almost 75 % of students in the top quarter of the population have the opportunity to earn a college degree (Rashid, 2016). These difficulties in the educational system occur not only in specific regions, but globally. In relation to GCE in HEI, several studies have been carried out regarding ECG in HEI. In this article, the contributions of the authors stand out: Morosini and Ustárroz (2016), Jarrar (2012), Grimwood (2018), Ortega, Córdón-Pedregosa, and Sianes (2013) and Khoo (2011), various studies on GCE in this level of education can be found.

The United Nations SDG 4 (Target 4.7) challenges universities to integrate GCE across the curriculum, empowering people to assume active roles, thus contributing to a more inclusive, secure, and sustainable world. Teaching and learning initiatives that integrate international, technology enabled collaborations with multiple languages (Hildeblando Júnior & Finardi, 2018) across the curriculum stand a better chance of preparing students for the complexities of life within the context of globalization (Rubin & Guth, 2015) and, more recently, for facing the challenges posed by the pandemic. And it is precisely a teaching initiative based on this SDG, in the style as mentioned, that is being reported in this article. The case study refers to the international partnership between the Federal University of Pernambuco (UFPE), practiced between the Agreste Academic Campus (CAA) and the State University of New York (SUNY), with the participation of the Rockland Community College (RCC) unit.

Though those initiatives are proliferating, especially after the Covid-19 pandemic, their potential as alternatives for GCE remains under-researched. Considering the current scenario of HE challenged by the crisis of the modern university (Sterling, 2001), internationalization seems to have been moved to a non-priority role (Marmolejo, 2020). Other more 'pressing' issues have

caught the attention of society and higher education institutions, such as the gap between university and society; decreasing government funding for HE; equity and access to HE; emergency aid for students and institutions, just to cite a few.

The global sustainability agenda challenges traditional pedagogies and calls for an education that promotes awareness of the complexities and uncertainties of the surrounding world. An academic organization that promotes such changes can be considered reflective of social learning and social movements (Lotz-Sisitka *et al.*, 2015). Mentioning this, it can be understood that school improvement refers to collective support factors in the organization that increase students' possibilities to learn in relation to a complex surrounding world. Thus, the focus of learning within the organization is a characteristic central point in a learning improvement process (Harris *et al.*, 2013). Thinking about this mentioned situation, a teaching methodology was created used in the discipline of Environmental Sustainability Applied, an undergraduate course at the Federal University of Pernambuco (UFPE).

This teaching method used at UFPE is COIL (Collaborative Online International Learning). This method is a teaching/learning modality created at The State University of New York (SUNY) by Professor Jon Rubin in 2006. Its objective was to encourage the growth of international online cooperative learning. This action remains, has developed, and in practice, occurs as follows: a professor from university A, in partnership with a professor from international university B, set up an online teaching program for their classes. So we have 2 universities, 2 professors, 2 classes, possibly 2 languages, at least 2 cultures and a course/module being co-taught by professors from both universities, with tasks to be developed in the virtual modality in a cooperative.

Global learning is not exclusive to traveling abroad, and thanks to current technology, it has never been easier to bring the world into the classroom. Collaborative Online International Learning advances SUNY Brockport's strategic creates greater access to global engagement for their students. COIL projects prepare students with the necessary employment skills to be successful in today's culturally diverse workforce and global economy. As an online course, it is advisable to connect with your partner and start the development of the course at least one semester before offering collaboration, so that knowledge of the methodology used can be possible. In this case study it became clear that the participation of the responsible academic advisors and the engagement of the participating university students from both universities formed the basis for the development of this teaching and learning program.

As benefits of this practice, the academic community has access to global learning integrated into the curriculum and for all; applied learning; developing the skills needed for the 21st century; intercultural awareness and skills development; interdisciplinary application of knowledge; diversity and inclusion; scalable and low-cost internationalization; high-impact practice for

teaching and learning. This practice has been attracting many other universities around the world in the last year, since the COVID-19 pandemic has increased the certainty that the virtual teaching/learning environment still has much to be explored and that it is a space for interculturality and development, for those who teach and learn.

Explaining the case of study

Sustainability has many definitions, including the ability to long-term “self” sustenance (Geraldino and Mendonça, 2006) to encompass interactions between economic factors, political, environmental and social (Nunes, 2009). Creating sustainable development (SD) is one of the biggest challenges that societies around the world face today. The global sustainability debate centers on how to achieve environmental sustainability and at the same time develop our world socially and economically (Berglund *et al.*, 2020). Therefore, we can say that sustainability is searching for balance and harmonious relationship between environment and human settlements. Worldwide governors, researchers, politicians, specialists are noticing the need for change in the way we humans create, maintain and develop our settlements.

The resources (food, water, land, gas, oil, etc.) are disappearing little by little, but the population is growing faster and faster, the scale of urbanization is rapid, and the climate change is more than obvious. In a global scale, the plans and policies are getting oriented into a direction ensuring the creation of “sustainable cities and communities.” This issue is highlighted as a GOAL 11 in the 2030 Agenda for Sustainable Development of The United Nations. The goal is focused on sustainable development, including sustainable urbanization and capacity for participation, integrated and sustainable human settlements planning and management in all countries to make cities more inclusive, safe, resilient and sustainable (UN, 2015).

In this case study described in this article, the SDG that is effectively put into practice is SDG 17. SDG 17 is about partnerships, national and international, to achieve the Millennium Goals and meet the Development Goals Sustainable Development proposed by the 2030 Agenda and the UN (United Nations). The SDG 17 can be considered a basis for compliance with the other SDGs, as it proposes to strengthen the means of implementation and revitalize the global partnership for sustainable development.

In this scenario, The Collaborative Online International Learning, called COIL, is an emerging pedagogy which re-purposes online education so that it serves a new goal. The main goal is providing meaningful international experiences for university students. Many students will have careers in which they must work with other nationalities or with clients or partners in other countries, often at a distance or as part of virtual teams. But very few institutions teach the skills needed to be successful in this emerging workplace. According to Rubin (2016), it is important to note that the institutions involved need to be equally engaged and committed.

The origin of COIL dates to 2006, when SUNY established the COIL Center to encourage faculty across New York State to incorporate an intercultural dimension into their courses, undergraduate and graduate programs. The COIL Center has provided guidance to dozens of SUNY campuses as well as other US institutions implementing COIL in their efforts to develop new collaborative courses (Rubin, 2016). In this context, COIL grew out of the grassroots efforts of a group of faculty at Purchase College who were researching ways to bring tangible international perspectives into their classrooms (Rubin and Guth, 2015).

The language of instruction is a critical point in any COIL proposal and should be discussed during project planning. The reflection on the language of instruction should consider both practical issues (availability and level of proficiency of students) and political (the role of majority/minority languages, the hegemonic role of some languages, among other issues). In the case study analyzed in this work, the language of instruction used is English, the classes are taught in part in English and in Portuguese. Thus, there is a linguistic exchange between the participants, with Brazilian students improving their English and learning new expressions with American students, and Americans learning Brazilian expressions and Brazilian accents. It is not uncommon to also find in RCC students who speak Spanish due to having attended, or even belonging to, Latin countries.

This educational model emerged in an innovative and spontaneous way. While innovators around the world created similar models such as Virtual Mobility, Global Network Learning, Virtual Exchange and Telecollaboration, Jon Rubin created the COIL format in 2002, after returning from a Fulbright fellowship in Belarus. He wanted his State University of New York (SUNY) students to interact with the students he taught in Eastern Europe, so he created an intercultural video production course where these students collaborated online to co-produce videos about their lives.

According to Haug (2017), most COIL projects consist of five essential phases, namely: 1) socializing or getting to know each other; 2) project management and process planning (organizing remote teamwork); 3) research and analysis; 4) presentation of research results; and 5) evaluation and reflection. Rubin and Guth (2015) argue that courses can employ a synchronous and asynchronous combination, or, depending on institutions' academic calendars, time zone differences between countries, and student learning objectives for modules, interactions can be fully synchronous or asynchronous.

The Courses give new contextual meaning to the ideas and texts that students explore, while providing new spaces to develop their intercultural awareness (Rubin and Guth, 2015). COIL can be thought of in different disciplines as well as within different courses/modules within the same discipline. The modules can last between four weeks or an entire semester and can be an online component of a traditional class or a hybrid course as well as a fully online course (Ceo-Difrancesco and Bender-Slack, 2016). COIL is not a one-size-fits-all model, but a framework

adaptable to any course, discipline and institution. This method has become even more widespread as the COVID-19 pandemic has progressed. Due to social restrictions imposed to prevent the spread of the virus, universities had to adopt remote and distance learning practices to continue with the main purpose of mediating knowledge and forming honorable civil citizens.

Within the context of internationalization, global competencies are quintessential as students should have the capacity to examine local, global and intercultural issues in general, to be able to understand and appreciate the perspectives and world views of others, to engage in open, appropriate and effective interactions with people from different cultures, and to act for collective well-being and sustainable development (OECD, 2018). Thus, it is imperative to ascertain, to what degree students can understand and appreciate multiple cultural perspectives and establish positive interactions with people of different national, ethnic, religious, social or cultural backgrounds.

In the example of Brazil studied in this article, communication and the knowledge mediation were carried out through online platforms recognized worldwide. At the beginning of the discipline of Environmental Sustainability Applied, in 2019, communication and classes were held synchronously, in person, among UFPE students, in the classrooms of the Agreste Academic Campus (CAA). The coordinator and professor in charge for the subject led the course, detailing tasks and projects to be carried out according to the themes of environmental sustainability. Communication with SUNY students and tutors was carried out asynchronously, through meetings via video calls via the WhatsApp platform according to scheduled times.

With the establishment of the COVID-19 pandemic, in mid-2020, the entire world scenario was changed, also interfering in the educational sector across the planet. As a result, the classes and meetings necessary to proceed with the COIL began to be carried out completely asynchronously, using a more robust and sophisticated digital platform to support the number of students in the discipline and meet the demands of the discipline. The platform used became Google Meet, which has a series of video and audiovisual resources and allows online recording. The classes held among the students of the UFPE discipline, as well as the virtual meetings provided by the adoption of COIL, were all carried out by Google Meet.

The students participating in the discipline had the means of accessing technology to hold virtual meetings, allowing remote teaching to be established in the period of aggravation of the pandemic. Therefore, even with a global health crisis, COIL was still possible to be implemented. This meant a great advantage for university from both higher education institutions and did not affect the process for acquiring knowledge. On the contrary, it made access to knowledge, information and the possibility of cultural exchanges a more democratic process. In addition, online learning allows for the possibility of fast and flexible communication between educators and their students as well as providing students with easy access to information (Curran, 2001).

This study plan is based on co-teaching and co-learning in a particular course, in this case, in the Civil Engineering undergraduate course, more specifically in the teaching and learning of topics related to environmental sustainability. The students are committed to working collaboratively in online shared learning environments, under the supervision of tutors from each culture. Villela (2014) mentions some advantages for institutions, tutors and students who engage with the COIL approach, such as developing intercultural awareness and understanding the communicative and digital skills, increasing new institutional partnerships driving curricular internationalization and attracting international students, new perspectives on the content covered and fostering professional and international development for tutors and staff.

This international partnership, using the SUNY COIL model, was implemented between the universities in early 2019, and continues to provide auspicious results. Therefore, universities are constantly renewing international partnerships. This international collaboration plan was designed around a topic that is much discussed these days, environmental sustainability. In the past decade or so, sustainable development has been one area that has received an ever-growing and undisputed attention whether we talk of governments, industry or academics (e.g. European Union 2014; United Nations 2016; Silvestre and Țîrcă 2019).

The discipline is conducted in person at the beginning, before the COVID-19 health emergency was declared, and then it became a discipline with remote classes due to the restriction of virus circulation. There was always the participation of professors and students from both institutions. Theoretical classes are conducted with didactic tools that arouse interest in the subject, through synchronous classes with a maximum duration of 2 hours using the G-Suite platform. Asynchronous activities will be made available through Google Classroom with their respective deadlines. The course is taught partly in English and partly in Portuguese, all for greater cultural contact and foreign language learning.

The discipline Environmental Sustainability Applied to Engineering, which addresses the different themes of environmental management, is based on the methodology of the G5 Environmental. The G5 environmental methodology, created in 2015 by the environmentally friendly extension project (AMA), aims to meet these needs by instituting an efficient and lasting environmental awareness. The methodology is composed of five axes, called G's, which address the following topics: water resources management; energy management; solid waste management; management of fauna and flora; knowledge management. This kind of example is based on five stages that underlie and structure the G5 Environmental Methodology are: G1-Water Management, G2- Energy Management, G3- Waste Management, G4- Flora and Fauna Management and G5- Knowledge Management.

This innovative G5 Environmental Methodology can be analyzed from two perspectives, the first as a practical teaching methodology that seeks a rapid dissemination of knowledge of environmental management and the second as a technology to mitigate impacts. environmental. The G5 Environmental Methodology consists of a knowledge management tool, functioning as a five-step cycle aimed at environmental management, where each of the five steps provides a detailed view of its topic and a relationship with the next step, thus creating, an endless closed cycle. At the end of the G5 Environmental cycle, it is possible to create an environmental awareness in the program.

Breaking down the teaching methodology used in the academic discipline of an international nature, each of the G's has a goal to be achieved. The G1 aims to demonstrate the importance of water in the life of living beings and the way it is distributed on the planet, highlighting the small amount of existing potable water and highlighting the need to minimize the inappropriate use of this water, such a precious resource. In addition to presenting this importance, the G1 demonstrates techniques that can be used to maximize and optimize the use of water resources to achieve various benefits for the environment. Throughout the course, sustainable projects, definitions and important updates on the topic are presented.

The G2 has the purpose of presenting the needs that human beings have in relation to energy sources, mainly with the sustainable use of this resource, which can be acquired by renewable and non-renewable sources. Soon the G2 will work on how to use this resource correctly, through techniques that avoid waste and direct the use of renewable energy sources. The G3 aims to raise awareness about the proper destination and disposal of waste, demonstrating the negative effects on the environment if this disposal is not carried out correctly. The G3 clearly conveys selective collection techniques and models such as the 5Rs (Rethink, Refuse, Reduce, Reuse and Recycle), encouraging the reuse of materials to reduce extraction of the planet's natural resources.

The G4 seeks to disseminate the importance of preserving the fauna and flora, presenting both animals and plants that are in a delicate situation due to the uncontrolled exploitation of ecosystems. The G4 encourages contributing to the conservation and revitalization of ecosystems damaged by environmental impacts. The G5 is considered as the main G of the cycle, since it has the objective, at first, to carry out a review of all the G's presented, in this way it is possible to verify and consolidate the knowledge taught. In a second moment, the G5 seeks to develop a critical and constructive sense of the members who are in the training phase to start a new cycle in search of new technologies and new knowledge so that there can be continuous improvement.

Meetings with international partners were always held asynchronously, but classes between students of the discipline in each location are held in person. In face-to-face synchronous classes, students can apply the inverted classroom methodology, where the students themselves are the

holders of knowledge that will be discussed with the tutors for a better improvement of the topic addressed. It is worth noting that the Rockland Community College system includes students from various locations, ethnicities and mainly from various courses at the teaching center, since the academic discipline is open to all courses present at the local university. Regarding UFPE, the profile of the academic discipline is more directed to undergraduate students in CAA.

Methodology

The central theme of the international partnership of this case study presented in the article is environmental sustainability. Which means that all synchronous and asynchronous encounters are modeled around the theme of sustainability. The base methodology of the discipline, already mentioned and explained above, is the G5 Environmental methodology. According to Haug (2017), most COIL projects consist of five essential phases, namely: 1) socializing or getting to know each other; 2) project management and process planning (organizing remote teamwork); 3) research and analysis; 4) presentation of research results; and 5) evaluation and reflection. This example mentioned between UFPE and SUNY has specific characteristics that guide the model used in the discipline, but the essence is based on the five essential phases mentioned by Haug.

The first phase, which may seem trivial, simple and recreational, is fundamental in creating group unity (Haug 2017). During this phase, trust is built, tutors, faculty, instructors and students are introduced, and cultural differences are explored. If this phase is omitted, the participants may have problems regarding the lack of communication, interaction and knowledge among themselves for the continuation and development of activities during the project. This stage can be defined as the moment when the person behind the technology is discovered, the participating individual is known and analyzed. For this reason, it is important that tutors facilitate some icebreaker activities and motivate students to use videoconferencing as a collaborative tool in asynchronous activities.

The second phase should also receive the necessary attention (Haug 2017). Cultural factors such as time orientation, leadership, communication styles, task orientation, level of ambition and group focus play an important role. It is up to tutors to explain how cultures may differ in their approaches and to help students deal with these differences (Haug 2017). The research and presentation phases show, according to Haug (2017), similarities with face-to-face projects. It is important to emphasize that it is essential to mention and decide deadlines in the delivery of tasks, since virtual teams are already challenged by the need to work remotely, needing a period to organize and produce the requested tasks. shorter periods and moments of reflection help maintain the student motivation.

In this context of the reported case study, the teaching-learning method used was based on online meetings as mentioned, where each meeting addressed a specific theme with a presentation activity. All synchronous online meetings are based on the five phases described by Haug. According to the teaching plan used, a weekly online meeting is held, and each meeting lasts approximately one hour, corresponding to the teaching time established by the teaching plan of the subjects. The amount of necessary online meetings was foreseen, however, according to the flow of the discipline, adjustments are always necessary so that all programming and teaching content are fulfilled, properly addressing all topics related to environmental sustainability, always based on the methodology G5 Environmental.

At the beginning of the course, a presentation is made of the teaching plan prepared by the academic discipline advisor. At the beginning, the partnerships, national and international, of the discipline, the G5 methodology of Environmental Management, the forms of evaluation, projects and presentations that are requested for the correct fulfillment of the academic discipline are presented. Basically, it is explained what will be charged and how it will be charged to each student of the discipline. Soon after, the students are divided into five teams, so that the G5 Environmental methodology is consolidated. Each team have to be responsible for a G of the G5 Environmental methodology. This division is important because it directs the subject of study of each participant of the discipline and leads to the main subject addressed during synchronous meetings.

In the case of Environmental Sustainability Applied, in addition to the international partnership with Rockland Community College through SUNY, there is the formation of a local partnership between CAA and a municipal school, Escola Maria do Socorro de Freitas Municipal Intermediary. This partnership is based on the elaboration of sustainable projects to be implemented in the environment of the school institution. Sustainable projects are developed throughout the discipline by each team responsible for one of the G's, and these projects must aim at improving the management of the respective resource related to the environmental G. All sustainable projects must be analyzed according to the feasibility for implementation in the Municipal School, since it is useless to elaborate a project that does not have the feasibility of effective execution.

The project elaboration scheme has a line of reasoning and follow-up according to the theme of the proposed initiative. The working dynamic works as follows: the G1 group must propose a project to improve water management in the municipal school, the G2 group must propose a project to improve the school's energy management, the G3 group must improve the management of waste from the school environment, the G4 must preserve the local fauna and flora, the G5 group must propose initiatives to expand the knowledge management of the members of the educational institution. During these semesters, the sustainable projects developed always showed satisfactory results and won over the students of both educational institutions.

Regarding the international partnership, the online meetings are called Face to Face Meeting, being considered unique and enriching moments due to the opportunity of an experience of cultural exchanges. One can analyze the division of the course into four modules. The first module consists of the Face to Face Meeting which is called icebreaking. The second module consists of the presentation of environmental problems, present in the country and in the cities of the Members, related to each G of the G5 Environmental methodology. The third module consists of the presentation of sustainable projects designed by Brazilian students and some innovative solutions for managing the resources being studied. The fourth and final module consists of the exchange of cultural presentations between the course members.

Icebreaking

In Icebreaking, which consists of the initial meeting, normally the duration time is 50 min and only a virtual meeting is needed to carry out this stage. At this stage, the course tutors introduce themselves, introduce the subject, and the participants socialize by getting to know each other. As mentioned earlier, if this phase is omitted, participants can have problems regarding the lack of communication and the development of activities. To further direct this step, some icebreakers and motivating activities are suggested to encourage students to use videoconferencing to build friendships and as a tool for collaboration in asynchronous activities.

What is usually done at this stage is the individual presentation of each member. During a certain time, the student of the course presents his name, age, his course, its characteristics, his experiences and talks about the most varied and diverse subjects possible, such as the family, what he likes and what he doesn't like (books, movies, series, music, food, sports etc.), basically it is allowed to talk about each one's life story. This sparks interest and creates connections between the students themselves. Some students present where they are currently present, such as their homes, school or work environment. Despite being a short presentation, it is possible to get to know the other person behind the camera better, creating bonds and lasting friendships with each other.

Presentation of environmental problems

In this module of the course, the groups already established, the 5 G's, start online presentations about each topic. The sequence of presentations does not follow a rigid rule, following the flow of information. Usually, the Brazilian and American groups G1, the G2, the G3, the G4 and the G5 are presented, to follow the logical sequence of the cycle of the G5 Environmental methodology. These presentations are delivered by any virtual instrument preferred by the teams, PowerPoints, Words, Videos, Canvas or any other digital tool and technological resource.

The Brazilian teams must present about the environmental problems correlated with the environmental resources of Brazil and the city of Caruaru. The American teams must present about the environmental problems related to the United States and New York State. If any

participant studies in one of the educational institutions participating in the international partnership, but is from another location (Country, State, City or Municipality), the team can, and is recommended, present about the environmental problems of these locations. This further enriches the process of cultural exchange and learning.

Environmental problems are presented according to the team's theme, the G1's groups discuss and exemplify existing water management problems, the G2 on energy management problems, the G3 on waste management problems, the G4 on the problems of fauna and flora management and the G5 mentions the difficulties and challenges for knowledge management. A deep and solid analysis of the problems related to the environmental resources of each location must be carried out. Therefore, it is possible to have a global perspective on environmental sustainability, the main theme of the discipline.

After the presentations, a time interval is available for questions, doubts and curiosities inherent to the process of acquiring knowledge. It is an active teaching methodology, called a flipped classroom, in which the students themselves are the researchers and holders of knowledge that will be mediated to their colleagues. The tutors help a lot in this phase, answering the pertinent questions, improving and adding knowledge, in addition to leading the members in an observant way, not interfering with the classic form of education. The key is the experience, research and knowledge exchange that are generated in this module.

The meetings are provided for the duration of fifty minutes per class established by the discipline's teaching plan. However, due to the amount and diversity of information, only one weekly meeting is usually not enough, sometimes requiring three meetings in total, which can be distributed in the most favorable way for the participants (one weekly meeting, two weekly meetings, or any another alternative). The duration of this module depends a lot on the profile of the semester's teaching class, the schedule adopted and the number of students in the class.

Presentation of possible solutions to environmental problems

In this module of the course, possible solutions, recent studies and research on the environmental problems mentioned in the previous module are presented. Each team will mention innovative solutions and methods that mitigate, or may mitigate in the future, the environmental problems that exist in the countries and localities studied, in order to make the environment more sustainable. This module is very challenging, as it proposes that students leave their comfort zone to provide means for sustainable development.

The Brazilian teams report on the local partnership with the Escola Municipal Intermediaria Maria do Socorro de Freitas, presenting the context of the sustainable projects developed by each team to provide better management of environmental resources. Sustainable projects, ideas and

conceptions are mustards, as well as the forecast of how they will impact the environment of the local partner educational institution. All details and forecasts are estimated and based on previous research and statistical data. These are projects that should be simple, but that have a significant impact on local environmental sustainability.

The American teams present current solutions, and even propose new solutions, for the environmental problems reported in the country and in the city. With this, the G's integrate with each other, and expand the perspective of analysis. The G1 reports on the sustainable management of water resources, the G2 on energy management, the G3 on the management of solid resources, the G4 on the management of fauna and flora, and the G5 on knowledge management. Sustainable initiatives are presented for the correct management and handling of natural resources.

This course module follows the same pattern as the others, with an estimated duration of 50 minutes for each virtual meeting. As the presentations are developed, knowledge is shared, and depending on the profile of the class and the scope of the related topics, a greater number of synchronous meetings will be necessary for the conclusion of the topic. At the end of each presentation, a period of time is available for questions and pertinent questions. The presentation and research phases show the ability of students and teams to approach and acquire knowledge about the topics covered in the discipline, in addition to consolidating the concept of applied environmental sustainability proposed by the course.

Cultural exchange

COIL prepares future professionals for a diverse and multicultural work environment of cultural exchange, assists teachers in offering subjects that promote interculturality, leverages online learning methods and helps achieve the institutions' academic objectives (Canto *et al.*, 2022). For Crawford, Swartz, et al. (2020, p. 993), COIL also enables the learning of social skills that are valued by employers and that are necessary in workplaces in the globalized world.

Academic cultural exchange is important for the emergence of new institutional cultural patterns. It is through this that a transformation can occur in the institutions involved. This is due to the fact that by opening dialogue between institutions, learning takes place in both, providing opportunities for transformation in both. Therefore, over the years of collaboration, continuing this collaboration from generation to generation, an adequate portion of the institutional culture of University A can be transmitted to University B, and from University B to A.

It is because human beings internalize forms of mediation provided by cultural, historical and institutional forces that their mental functioning is sociocultural situated (Vygotsky 1978) and each culture has its own set of tools and psychological situations in which the tools are appropriate (Wachter, 2003). In this sense, culture, according to Severino (2010, p. 81) means “a

conjunction of objects that result from the productive, social and symbolic activities of men". To expand cultural exchanges, the concept of cyberspace has been increasingly used. Cyberspace is used as a space for obtaining new knowledge, the locus of practices that constitute cyberculture, providing cultural exchange without effort providing cultural exchange without spending great efforts related to financial expenses on travel, food or accommodation, and the use of sophisticated equipment that requires qualified labor to handle.

In this final module of the course related to international partnerships, cultural exchange is the main target. It lasts for approximately 50 minutes, but most of the time, since it is a fundamental step, the time is extended so that this interaction can be completed in a single synchronous meeting. Students, through this stage, learn about the main cultural aspects of each study location. Different cultural aspects are addressed in this virtual meeting, making possible the knowledge of the existing cultural diversity on the planet. Without leaving the country of origin, it is possible to know the culture of other countries in a more comfortable and comprehensive way due to globalization, which entails the transposition of barriers for the transformation of cultural education.

Brazilian students present about the culture of Brazil, giving main emphasis to the cultural aspects of the city of Caruaru, where the CAA is located. Through videos, photos, music and other utilitarian digital resources, students present information about the region's cuisine, the main tourist attractions, the main commemorative parties and events in the region, as well as the main renown and representatives of Brazilian and local culture. To address each of the cultural topics mentioned, teams are divided differently, in order to standardize the number of members, groups G1, G3 and G3 are usually included in a single team, and groups G4 and G5 in another team, directing the topics to each other.

North American students also present on the main cultural aspects of their country and region. Cultural topics such as cuisine, main festivals and local attractions, festive and commemorative dates, social behavior, habits and traditions are addressed, as well as the main renown and highlights that are part of the local culture. As the RCC is a very comprehensive university center that houses members from various regions, countries and continents; if there are members from other locations, it is productive for these members to also present the cultural aspects ingrained in their culture, for a more enriching cultural exchange.

Results

The collaborative universities centers CAA and RCC developed an ideal curriculum to enhance and nurture students' "Future Work Skills 2020" define by the Institute for the Future. Such Future Work Skills, defined as Sense Making, Social Intelligence, Novel & Adaptive Thinking, Cross-Cultural Competencies, Computacional Thinking, New Media Literacy, Transdisciplinary, Design

Mindset, Cognitive Load Management, and Virtual Collaboration, are very necessary in a globalized world. The curriculum fully employs PBL (Problem Base Learning) strategies in global teams, where teams for PBL are organized with students with heterogenous cultural backgrounds in a virtual environment.

In the case study of the UFPE international partnership there is still an additional factor that is observed as a result of synchronous interactions. This additional factor is the use of COIL to develop a distance project between two or more institutions involved, intercultural competences, digital skills and exchange of teaching, knowledge and learning. The interest of Brazilian students in internationalization offers practical experiences that are highly valued in the job market, such as: Managing situations of leadership and motivation; Improve communication skills; Interculturality; Learning new languages; Interact, participate and collaborate with people from different cultures; Networking; Find new applications of technology in the current scenario; Development of digital skills, etc.

The effective participation of students in this COIL project is the key to providing an international experience at low cost to the institution, providing intercultural experience to those who did not have an opportunity to exchange. The project aims to increase the interest of international students in Brazil, as a study destination, more specifically, at UFPE, since it aims at the internationalization of the campus, providing its exposure to interested parties. It is also possible to mention the incentive for Brazilian students to develop exchange partnerships with SUNY, aiming to overcome barriers to expand the frontiers of Knowledge.

An interesting result is that the practice of COIL can develop linguistic competence due to its multimodal form (audio, video and multimedia materials)" (Hildeblando Júnior, 2019). The use of multimodal materials not only helps retain students' attention, but also has the potential to improve learning outcomes, as participants feel more engaged with interactive video conferencing materials as they enable the provision of immediate, accurate, consistent and individualized feedback. In addition to assisting language development, COIL can also facilitate content development, as features, for example, "screen sharing, images, music, chat options, audio calling and other features of the software used", can be used as mediation tools to help in this process (Júnior; Finardi & El Kadri, 2022).

Qualitatively, it is observed that students who go through this experience of academic internationalization do not have the same mentality as before when they started the discipline. The first factor that is transformative for university students who take this discipline of the undergraduate course is the development of a sustainable conscience, which provides sustainable development. Students, throughout the course, learn about existing environmental problems in a global sphere, about how it is possible to implement an adequate management of environmental resources, and even to propose innovative solutions to ensure environmental sustainability.

With this, the vision of environmental sustainability is expanded, and students thinking globally can act in a practical way locally, proposing improved alternatives for the management of environmental resources. Students who participated in this course report that it is a unique and innovative experience. Academic students are very interested in the subject of environmental sustainability, and when this discipline is combined with the opportunity for cultural exchange with other universities, with learning of multicultural interaction, the challenges of the discipline become even more instigating for the intellectual development of the participants.

Indirectly, the benefits observed for those who attended the discipline are the development of leadership skills, due to the need for constant weekly teamwork, and mainly the indirect benefit in obtaining academic results in other disciplines of the courses, since the discipline of Environmental Sustainability encourages students to participate in new challenges and proposes a more effective way to implement study plans, where the student must pursue and obtain new knowledge, always with the help of the professors. Directly, there is the opportunity to practice new languages, especially English, which is so necessary in the globalized world.

Conclusion

The internationalization of higher education, in turn, is the hallmark of the relationships between the different universities and is at the heart of the university process, legitimizing the circularization of knowledge. Thus, the characteristics of education are closely intertwined with the process of globalization and internationalization. Basically, it is the impacts of these processes that will shape the social profile of graduating students, who will now be considered active citizens in promoting effective changes in society. In this analyzed case of study, the international partnership is carried out through the UFPE and SUNY universities, having as a basis for conducting the process the COIL prepared by SUNY.

This internationalization partnership offers practical experiences that are highly valued in the job market, such as: managing situations of leadership and motivation; improve communication skills; interculturality; interact, participate and collaborate with people from different cultures; learning different languages; Networking; find new applications of technology in the current scenario; digital skills development. Therefore, the basis of this taught subject is to provide cultural exchange between university students.

As part of the science course Environmental Pollution Topics, American students effectively practiced the concepts of water, energy, waste and fauna and flora management, also applying ways of managing the knowledge obtained. Through research and information exchange, students have accumulated a certain amount of knowledge about environmental sustainability and sustainable development. With the diversity of professions and university education on the

part of Americans, the use of the acquired knowledge can be applied in the most diverse areas of student training. Already in the job market, they also improved their ability to manage leadership situations; improve communication skills; interculturality; interact, participate and collaborate with people from different cultures; and learn a different language.

The main differential of the COIL partnership mentioned in the article is the training of individuals, mainly engineers in the case of CAA, with adequate training about environmental sustainability, and with a practical environmental awareness that can be implemented in daily life. The course discipline proposes to act locally, thinking globally, so that the concept of sustainable development can be disseminated in countries. Initiatives of educational plans like this prove that it is possible to fight for a more sustainable and global world, where there are no insurmountable barriers to development.

Agradecimientos

The authors would like to thank the Foundation for the Support of Science and Technology of the State of Pernambuco (FACEPE), the Postgraduate Program in Civil and Environmental Engineering (PPGECAM), the Advanced Environmental Management Group (GAMA), and the Academic Center of Agreste from UFPE, for all the support and encouragement for the development of the research.

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