

# Developing Global Competences and Values for Sustainable Development for Interdisciplinary Students Through a COIL Experience Between Chile and Colombia

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**Abstract—** This full paper on innovative practice reports a COIL (Collaborative Online International Learning) educational experience, based on the UNESCO's Education for Sustainable Development (ESD), designed to teach about water resource management, strengthen attitudes and values towards sustainable development, and develop intercultural competences in undergraduate students from Colombia and Chile. 60 third-year engineering students from Chile and 40 students who attend basic science courses to enter a medical career from Colombia were involved in the practice. The didactics were based on the main COIL's elements (icebreaker, collaborative task, and reflection), and introductory activities for cultural exchange, collaborative content production, and reflection through a learning log were implemented. The experience was developed around the analysis of severe hydric stress of two regions: Coquimbo (Chile) and La Guajira (Colombia). Attitudes and skills for interculturality, and socio-affective development goals were assessed. The results showed that the students understood the global nature of the problems and the urgency to address them through an ESG (environmental, social and governance) approach. In the socio-affective dimension, the students progressed from feeling fearful, shy, and frustrated, to feel motivated and sensitized towards the problem analyzed, and towards the experience of intercultural exchange. Additionally, they showed interest in reflecting and modifying their water consumption habits and becoming active agents of change. The experience left learnings about the key factors for successful COIL implementation, such as curricular and operational logistics, sociocultural differences, the nature of the topics discussed, and the type of didactics that should be used for authentic student involvement.

**Keywords—** COIL, education for sustainable development, global competences, socio-affective competences, virtual exchange, interdisciplinarity

## I. INTRODUCTION

As part of the strategic initiatives within the Chilean Engineering 2030 program, which aims to catalyze profound changes in higher education models, one key focus area is the innovation in engineering education and internationalization [1]. The Universidad Técnica Federico Santa María, within this

context, advocates for the implementation of Collaborative Online International Learning (COIL) experiences. These endeavors seek to enrich the international exposure of students by leveraging the institution's academic connections and collaborations.

On the Colombian front, the Universidad El Bosque is carrying out an educational research project whose purpose is to construct an interdisciplinary ecosystem where various stakeholders converge to cultivate ethical competencies among undergraduate students. This initiative involves designing and implementing innovative educational practices within the framework of sustainable development education (SDE), with service learning as a primary pedagogical approach. These stakeholders include faculty members from basic sciences and humanities departments, community leaders, companies, and non-profit organizations.

Given the shared interests of both institutions, it was proposed to implement a COIL experience as an innovative practice. The objective is to provide students with information and foster reflections on climate change and water scarcity.

In Chile, the participating students consist of 60 individuals aged approximately 20 to 21 years old, enrolled in the sixth semester of the industrial civil engineering program. They are currently undertaking the Energy Management I course, which predominantly focuses on applied Fluid Mechanics topics. In Colombia, the participants comprise 40 students aged between 16 and 18 years old. They are enrolled in a biology course specifically designed to prepare them for admission to a medical career.

Climate change and water scarcity were chosen as primary topics due to the global imperative outlined by organizations such as the United Nations (UN) and its science and cultural arm, UNESCO. These entities call upon universities to provide high-quality education that equips students to become well-rounded professionals committed to sustainable development. Specifically, in alignment with the 2030 Agenda, Sustainable Development Goal 4 emphasizes the need for all learners to

acquire the knowledge and skills necessary to promote sustainable development. This includes education on sustainable lifestyles, human rights, gender equality, peace culture, non-violence, global citizenship, and an appreciation of cultural diversity and its contribution to sustainable development [2].

UNESCO's Sustainable Development Education offers a pedagogical framework that provides clear guidelines for defining learning outcomes, content, learning environments, and teaching methods. The aim is to cultivate students as transformative leaders and change agents capable of addressing global challenges. The framework seeks to empower learners of all ages with the knowledge, competencies, values, and agency required to tackle interconnected global challenges such as climate change, biodiversity loss, inequality, and unsustainable resource use. Key principles of this framework include supporting participation and collaboration, problem-oriented learning, interdisciplinary and transdisciplinary approaches, and integrating formal and informal learning methods.

Several principles of the Internationalization at Home (IaH) approach were taken into consideration [3]. Firstly, the innovative practice should provide students with a global perspective on a common issue by bringing together individuals from diverse backgrounds, thereby enhancing the quality of the programs. Secondly, the experience needed to extend beyond the technical and specialized aspects of the courses. Thirdly, it should incorporate virtual mobility through online collaboration with students from partner universities. Fourthly, opportunities for student engagement with individuals from different cultures, fostering collaboration and exchange, had to be created.

A COIL activity aims to facilitate collaboration among students from various countries on a shared theme, emphasizing the internationalization and intercultural experiences of the participants. Collaboration is facilitated as these kinds of experiences help students and faculty to develop skills and competencies such as communication, critical thinking, problem solving, which are global competencies [4], [5]. These activities typically last between 1 to 2 months. In such endeavors, instructional design plays a crucial role, as it should not only include icebreaker activities to promote student interaction but also ensure a balanced mix of synchronous and asynchronous tasks.

A COIL activity necessitates an appropriate and attractive design, effective coordination among instructors to ensure clear communication with students, and the use of appropriate technological tools to facilitate interaction during both synchronous and asynchronous sessions [6].

The chosen theme for the design of the COIL activity centers on the water crisis. This topic was selected due to its alignment with the experience of the participating instructors, particularly in the realm of Education for Sustainable Development, focusing on Sustainable Development Goals (SDG) 6 and 13 (clean water and sanitation, and climate action); and addressing water scarcity, which is a key component of the project course undertaken by Chilean students. Additionally, it represents a common issue not only for both countries but for the global educational community. As is stated in [7], as part of the Global Classroom Program, a COIL provides significant experiences that promotes United Nation SDG[7]

For the Chilean students, the challenge of the experience lies in the ability to engage with Colombian students to explore the similarities, differences, and challenges pertaining to the water crisis. As for the Colombian students, who are preparing to pursue a medical career, the experience prompts them to reflect on how human health may be impacted by the management of natural resources. They are encouraged to understand the interdisciplinary approaches required to address the challenges and improve the health and well-being of underserved communities. To achieve this goal, it is necessary to develop the community engagement and social awareness competencies, what could be achieved through a COIL experience focused on these kind of activities.[8]

## II. METHODOLOGY

As part of the Internationalization activities of the engineering 2030 project, the teachers involved participated in a synchronous virtual training of 4 sessions, given by teachers from Florida International University (FIU). In these 4 sessions not only the formal aspects of a COIL activity: key elements, organization and technological aspects, but also the detailed instructional design was worked on through a template provided for this purpose that was worked on jointly and with comments from those responsible for training.

The COIL experience was crafted and executed in accordance with the principles of IaH, as well as the key components of COIL design. A research process was conducted to evaluate the experience in terms of intercultural learning and exchange, and to assess the learning outcomes and reflections developed by students regarding water resource management and its effects on communities.

### A. Regarding the selected topics

Considering the diverse cultural and educational backgrounds of the students, their enrollment in programs across different disciplines, and their varying stages of academic careers, it was decided to bring them together to reflect upon and learn about the same global issue, albeit from local perspectives. This choice not only enabled them to comprehend the impacts of global problems on distant regions concurrently but also enriched the learning process by providing valuable insights into the cultural and human characteristics of individuals whom they may never have the opportunity to encounter.

Specifically, two regions were chosen for study: Coquimbo in Chile and La Guajira in Colombia, both grappling with critical water scarcity issues. In both regions, prolonged droughts have persisted for years, prompting governments to implement emergency plans to address the problem. These shared challenges, along with commonalities in diagnosis and proposed solutions, served as focal points in designing the activity, fostering shared dialogue and engagement among the students.

### B. Regarding the topics and learning outcomes

The COIL activity titled "Water crisis and climate change: shared experiences Chile-Colombia" was designed in 4 synchronous sessions:

TABLE I. COIL EXPERIENCE LEARNING OUTCOMES (LO)

Dimensions	SDG 6	SDG 13
Cognitive	<p>LO2: The learner knows about the unequal distribution of access to safe water and sanitation services worldwide.</p> <p>LO3: The student understands the concept of integrated water resources management (IWRM) and other strategies to ensure availability and sustainable management of water and sanitation, including flood and drought risk management.</p>	<p>LO5: The learner knows the main ecological, social, cultural and economic consequences of climate change at the local, national and global levels, and understands how these can become catalysts and drivers of climate change.</p>
Behavioral	<p>LO4: The student is able to elaborate a plan for the reduction of his/her individual water footprint in his/her daily habits.</p>	
Socioemotional	<p>LO1: The student is able to communicate different aspects of the water resources management problems in the analyzed community, giving his/her points of view, and recognizing the similarities and differences of the problems from the different scenarios.</p>	<p>LO6: The learner is able to collaborate with others to design common strategies to address climate change.</p> <p>LO7: The student is able to recognize that global climate protection is an essential task for all of us, and that we need to re-evaluate our worldview and our daily behaviors in light of this.</p>

- Water crisis and its relationship with climate change.
- Integrated Water Resource Management (IWRM) and some solutions to the water crisis.
- The ESG approach.
- Main challenges of the discussed solutions and contribution of personal attitudes towards the problem of water scarcity.

As one of the principles of IaH states, the experience had to move beyond the technical and specialized aspects of the courses. According to the principles of SDE, the learning outcomes should emphasize a transformative and action-oriented pedagogy. It was for this reason that they were defined not only for the cognitive dimension but also, for the socioemotional and behavioral dimensions, converging the learning goals of each course in Colombia and Chile.

### C. COIL's main activities

**Icebreaker activity.** At the beginning of the first session, students exchanged information about their cultures to recognize some differences in the languages used to communicate, and the habits that identify them as belonging to a particular culture (e.g., city of origin and specific thematic groups or subcultures).

The activity was oriented by the following questions:

- Which group or subculture do I belong to?
- What words, sayings or expressions have particular meanings in my cultural environment?
- What recurring habits or practices identify the culture to which I belong?

The idea was that by sharing their answers to these questions, students will discuss the cultural norms that differentiate their backgrounds.

**Collaborative tasks.** To accomplish the third and fourth above mentioned principles of IaH (virtual mobility and

opportunities for student engagement, by means of collaboration and exchange), and organize the main COIL experience components, the didactic plan was designed including 3 activities for preparing the studied topics, an icebreaker activity, 4 synchronous sessions (one each week), and 3 asynchronous collaborative activities, as is described as follows:

- Previous readings (PR): Before each session, students had to read some selected web resources introducing the session's main subject (news, documents and reports)
- In-session activities: Each synchronous session was structured in 4 moments: 1) Welcome to the session (WS) 2) Delivery of content and guiding questions to discuss in the exchange moment (DC). 3) Small collaborative groups connection and discussion (SCG) 4) Final comments (FC). The small groups were organized seeking equitable students' participation from both countries.
- Post-session activities (PA): Using asynchronous collaboration and communication tools, each international teams of students had to cooperate to create a learning digital product (LDP).

Table I shows the defined learning outcomes for SDG 6 and SDG 13. Table II presents the general didactic plan of the COIL experience.

**Reflection activity.** Having in mind that in this kind of learning experience it is also important to evaluate the international exchange experience, an intercultural experience log was designed. Weekly, the students had to fill this log, registering how they were living the experience, not just in didactic terms, but in emotional and intercultural aspects.

TABLE II. COIL EXPERIENCE DIDACTIC PLAN

Session/week	Synchronous	Asynchronous
Prev	-	Previous watching: “The danger of a single story” TED talk video [5], and Zoom tutorial.  PR on water resource management and climate change. PR on the problem in La Guajira and Coquimbo regions
1	Icebreaker activity DC: Relation between Water resource management and climate change. SCG: Comparative analysis of the problem in each region, stating similarities and differences. FC: Task assignment and answering questions	PA: Intercultural experience log filling LDP1: A 5 minutes video presenting the comparative analysis results.
2	DC: Brief description of technical solutions to mitigate the water problems SCG: Team discussion about the characteristics of the technical solutions, analyzing advantages and disadvantages for each studied context. Exchange and discussion of individual attitudes and actions that could affect the own hydric footprint. The students should register the results of their discussions in a collaborative board. FC: Task assignment and answering questions	PR on water resource management and technical proposals for mitigating the problem in the analyzed community. PA: Intercultural experience log filling. LDP2: Infographic containing the analysis of the technical solutions (first version)
3	DC: Explanation about the ESG (environmental, social and government) approach for sustainability SCG: Team discussion about the available technical, social and cultural solutions to mitigate the problems, and possible individual and community strategies to face the crisis in the studied contexts. The students should register the results of their discussions in the collaborative board FC: Task assignment and answering questions	PR on ESG approach PA: Intercultural experience log filling LDP2: Continuing the infographic construction adding information about environmental and social impacts of each solution, hierarchizing them for the studied contexts.
4	DC: Teachers made feedback about the teams’ work SGC: The teams finished the strategies proposal to face the crisis in the studied contexts and had to register the results of their proposals in the collaborative board. They had to reach an agreement about how they individually could contribute to reduce their own hydric footprint. FC: Task assignment and answering questions	PA: Intercultural experience log filling and completion.  LDP2: Infographic completion including the individual plan for reducing the hydric footprint.

The register of the log was oriented by the following guiding questions:

- What challenges did this week bring me with respect to the experiences I had, and the tasks we were asked to do (take into account academic, social, individual challenges)?
- How did I deal with these challenges?
- What characteristics and/or information of the community analyzed became important to keep in mind this week?
- What were the most important ideas/learnings I learned regarding climate change and water resource management
- What feelings/emotions did I experience this week?

#### D. Assessment activities

To assess the achievement of the learning outcomes, the collaborative learning digital products elaborated by the teams

were evaluated using a simple scale for the first digital product (the video analyzing the water scarcity problems in context), and a rubric for the experience main product, which was an infographic.

TABLE III. SCALE FOR ASSESSING THE VIDEO

Learning outcome	Scale
The student is able to communicate 1) the different aspects of the IWRM in the analyzed communities, 2) giving his/her points of view, and 3) recognizing the problem’s similarities and differences between two different scenarios. (LO1 - See table I)	<b>Low (0 - 2.9 pts):</b> 1 or none of the criteria are accomplished
	<b>Medium (3 - 3.9 pts):</b> 2 of the criteria are accomplished
	<b>High (4 - 5 pts):</b> All 3 criteria are accomplished

The video was the learning product to assess the defined outcome in the socioemotional dimension (LO1 as seen in Table I), while the infographic should demonstrate that the teams achieved the proposed learning outcomes in the cognitive and behavioral dimensions (LO2 to LO5). Table III presents the

scale for assessing the video. Fig. 1 provides an example of these videos.



Fig. 1. Example of video analyzing the water crisis in Chile and Colombia

Four levels of performance were defined to assess the infographic, depending on the completeness of the content. Table IV shows an example of the rubric, assessing LO2.

E. Digital materials and tools

The experience was completely supported by digital resources, materials, and tools, as explained as follows:

**Session plan.** Before each session the students were given a document containing a minute-to-minute description of the activities that will be carried out

**Zoom® platform.** This tool was used to connect the teachers and students to synchronous sessions.

**Power Point slides.** To deliver the contents, 3 Power Point presentations were designed, one for each topic

TABLE IV. RUBRICS EXAMPLE FOR ASSESSING LEARNING OUTCOME 2

Level of performance	Level's description
High (4.5 - 5 pts)	The infographic presents relevant data and information that evidences the problem of unequal distribution of drinking water and sanitation services in the global environment.
Medium-high (3.5 - 4.4 pts)	The infographic presents relevant data and information that evidences the problem of unequal distribution of drinking water and sanitation services in the national environment.
Medium (2 - 3.4 pts)	The infographic presents general information related to water and sanitation services, without being related to global or national issues.
Low (0 - 1.9 pts)	The infographic does not present any information that evidences the problem of unequal distribution of drinking water and sanitation services.

**JamBoard.** This collaborative board was used to give students a place where they could register the obtained results from each small groups discussion, which would be the input for elaborating the infographic, that was the main learning product. Fig. 2 presents an example of the small groups discussions’

results, analyzing solutions to counteract climate change and water scarcity.



Fig. 2. Example of collaborative analysis for technical solutions

**WhatsApp.** This tool was used for asynchronous communication and cooperation to elaborate the learning digital products.

**Google Drive.** In this platform the intercultural experience log for each team was recorded and set available for filling. Google Drive platform was used to record some learning digital products too.

**Google Slides.** This tool was used by the students to write an individual hydric footprint reduction plan, at the end of the experience. An example of the students’ hydric footprint reduction plan are shown in Fig.3.

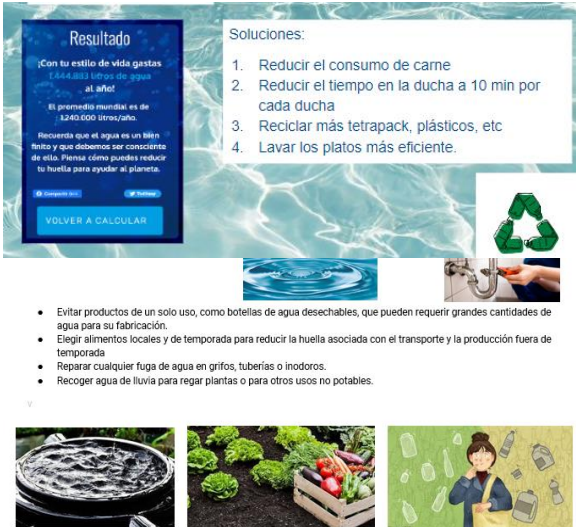


Fig. 3. Example of hydric footprint reduction plan

**Aula - Chilean learning management system based on Moodle.** This platform was used to give Chilean students important information such as the sessions planning, the previous reading materials, and the slides supporting each session. The students delivered their assignments through it.

F. Deployment and collecting data process.

The synchronous sessions were developed using the Zoom platform that allows synchronous connection of students and work in small rooms. In addition to the main activities planned for the synchronous sessions, during the work in small rooms, the teachers alternately entered each room to answer questions,

guide the work and verify that interaction was taking place between the students from both countries.

The intercultural experience log was distributed to the students from the first moment of the experience, nevertheless, it is not sure that the groups filled the instrument in the moments planned (each week/session). In fact, there were groups that never filled it up. Nonetheless, the collected data about the experience provided some important information not only to evaluate the activity, but also to think over some decisions taken and the didactic plan in order to make some improvements for the next cohort.

As the first digital learning product, the videos were loaded in YouTube, which was asked before the beginning of the second session. As they were collaborative online tools, the information registered in Jamboard and in the intercultural log, were observed online. As final digital learning product, the infographic was delivered through Moodle platform one week after closing the experience as a PDF file. Fig. 4 shows an example of the infographics.



Fig. 4. Example of the matrix to analyze the intercultural experience.

The obtained results are presented in two sections. The first one corresponds to the evaluation of the intercultural and exchange experience, according to the data collected by the intercultural log. The second section shows the obtained results in the learning outcomes, according to the assessment instruments.

A. Evaluation of the intercultural experience

	What challenges did this week bring me with respect to the experiences I had, and the tasks we were asked to do? and How did I deal with these challenges?	What characteristics and/or information of the community analyzed became important to keep in mind this week?
Small group 1	Working in a group with colleagues who are a long distance away and have a different territory full of new things, represented perhaps a challenge in communication, but thanks to the technological tools and dialogue it was possible to achieve it. Communication to make the video; It was difficult to establish communication.	the hydrological situation it is going through; Water crisis in different places and their problems;
Small group 2	Academically, the experience was somewhat complex due to the academic load and the lack of overlapping schedules. This meant that we were not always able to share optimal times to do homework and assignments, which did not turn out to be that complicated or difficult to complete. Nevertheless, the social interaction with people from other countries was an unforgettable experience.	Knowing that there are people having a hard time because of the lack of access to water makes me reflect on my use of water, making me aware of the importance of and using this resource responsibly;

Fig. 5. Example of the matrix to analyze the intercultural experience.

To assess the COIL as an intercultural exchange experience, it designed a huge analytic matrix, where the most important information from each group’s responses to the log guiding questions were selected and analyzed. As it was stated, because there was no constant information registration in the log, only the obtained results for the first and the last week were

considered to carry the analytical process. Fig. 5 shows an example of this analytic matrix.

The results obtained respecting the intercultural learning experience, according to the responses given by the students in the intercultural log were as follows:

**Q1: What challenges did this week bring me with respect to the experiences I had, and the tasks we were asked to do? and How did I deal with these challenges?** Regarding the exchange experience, the most encountered challenges were related to communication problems (both technical and cultural), collaborating to reach agreements in the execution of collaborative tasks, managing the time difference to coordinate work sessions, and allocating time to exchange knowledge and insights. It can be stated that the challenges faced by the students changed from the beginning to the end of the experience. Some groups continued to experience communication problems, particularly related to the cooperative tasks required to create the digital products and understand the assignments. It is noteworthy that student participation in both asynchronous tasks and synchronous sessions experienced a significant decline during the final week. The students reported that they had to rely on their communication skills to overcome challenges, such as motivating others and showcasing their best personal qualities. Additional strategies included independently initiating additional icebreaker activities and avoiding the use of expressions specific to their own countries. Figure 6 shows a word frequency analysis performed on the set of terms responding to this question.



Fig. 6. word frequency analysis performed on the set of terms responding to this question.

**What characteristics and/or information of the community analyzed became important to keep in mind this week?** The most significant findings regarding this question revealed that students were acutely aware of the true scale of the water scarcity problem and its impact on diverse populations in distant regions. Some students indicated that this awareness prompted reflections on their own water consumption habits. Additionally, they learned about the relationships between climate change and the water crisis. In the final week, the students reported that they learned about the multiple dimensions of the water crisis, understanding that it affects not only wellbeing and health but also cultural and social systems.

**What were the most important ideas/learnings I learnt with regarding climate change and water resource management?** The most important insights highlighted by the students were related to the roles that various actors play in the water crisis. Both individuals and companies bear responsibilities in either mitigating or exacerbating the crisis.



**What feelings/emotions did I experience this week?** Given the differences in sentiments expressed by the students from week to week, a sentiment analysis was conducted to understand all recorded sentiments throughout the entire experience, using the NVivo 14 sentiment analysis tool [9]. Fig. 7 presents the sentiment classification by frequency for each week. The results showed that in the first week, students experienced interest, motivation, anxiety, and some nervousness (more negative than positive). That week, the activities raised awareness and amazement among students, as they learned about the critical situations faced by people in other countries. In the second week, motivation increased, and feelings of happiness, stress, and joy emerged, possibly being the reason why all sentiments classified as “neutral”. In the third week, stress, confusion, and anxiety remained the most frequently manifested sentiments, alongside curiosity, joy, and awareness. Notably, the sentiments expressed by students in the third week were primarily related to the intercultural exchange experience, with very few related to the studied themes.

The figure consists of three treemap charts, each representing the sentiment distribution of tweets for a specific week. The first chart, 'Sentimientos\_COVID\_semana2', shows a large 'Neutral' category. The second chart, 'Sentimientos\_COVID\_semana1', shows a large 'Negativo' category, a smaller 'Positivo' category, and a 'Neutral' category. The third chart, 'Sentimientos\_COVID\_semana3', shows a large 'Negativo' category, a smaller 'Positivo' category, and a 'Neutral' category.

A word cloud of various emotions and experiences. The words are arranged in a circular pattern, with some words appearing larger and more prominent than others. The colors are primarily shades of blue, green, and yellow. The words include: awareness, country, first, with, know, was, sadness, bit, interest, for, that, another, anxiety, precarious, situation, little, motivation, nervousness, nostalgia, agreements, demotivation, activities, happiness, less, reflection, stress, experience, end, again, that, felt, happy, agrees, what, work, when.

To evaluate the NVivo Sentiment Analysis tool’s precision, it was consulted the number of references that were classified, finding that the tool could not classify most of the sentiments processed, as they were originally written (in Spanish), as can be seen in Table V.

TABLE V. REFERENCES CLASSIFIED BY SENTIMENT

	Very negative	Moderately negative	Moderately positive	Positive
Session/week 1	1	2	1	0
Session/week 2	0	0	0	0
Session/week 3	0	1	0	1
Session/week 4	0	0	1	1

As it was stated, the achievement of the defined learning outcomes for each SDG was assessed through two main collaborative learning digital products. The video that was asked for the first week, and the infographic that was elaborated from the second week until the end of the experience and constituted the final deliverable for the course. Fig. 9 shows the results obtained by each group of students respecting the LO1, classified by levels of performance according to the scale

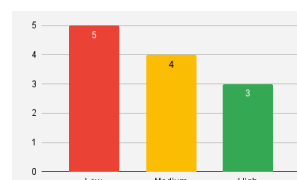


Table VI shows the grades obtained in the infographic by each small group of students.

	Small group number										
Learning outcome	1	2	3	5	6	7	8	10	11	Average level	
LO2	1	1	5	1	1	3	1	1,8	1	1,7/ Low	
LO3	4,5	2	5	4	5	4	3,5	3,5	3,5	3,9/ Medium High	
LO5	3	1	3	2	2	4,5	3	3	1,5	2,5/ Medium	
LO4	2	3	5	1	1	5	3	1	1	2,4/ Medium	
Average	2,6	1,7	4,5	2,0	2,2	4,1	2,6	2,3	1,7		

The grades obtained in the infographics show that most of students learned the main ecological, social, cultural and economic consequences of climate change in both, local and international levels. In the opposite, it appears that it was difficult for the students to understand the unequal distribution

of access to water and sanitation, at least, for the two studied contexts.

It was carried out a general qualitative evaluation on the infographics content, finding the following:

- Most of the infographics do not provide data about water crisis in the communities analyzed.
- Almost no information was included about personal responsibility for reducing water scarcity.
- Few aspects attributable to health issues related to the water crisis are mentioned.
- The topic of water resource management, technologies and ESG approach was well presented in the infographics, showing the contribution of Chilean students in this area.

It is important to note that it was decided not to evaluate LO6 and 7 during this first implementation of the COIL's experience, because the collected information was not enough to assess their accomplishment. However, these learning outcomes were observed throughout the experience, analyzing participation and collaboration reflected in the Jamboard contents and entries. The assessment for those are considered for future implementations.

#### IV. DISCUSSIONS AND CONCLUSIONS

The intercultural log provides relevant information about the emotions experienced by students during the intercultural exchange. It is remarkable that the students were highly motivated to participate in the experience, knowing that they will be interacting with other people of similar ages from a distant country. This could perhaps account for the initial feelings of anxiety. The results indicate negative feelings towards the end of the COIL activity, which can be associated with both the difficulty of communicating with others and the awareness of the impact of the water crisis on a global scale and particularly in the two communities analyzed.

Some studies examine students' experiences and emotions during Collaborative Online International Learning (COIL) projects. [11] highlights how differences in academic cultures can lead to divergent student experiences in COIL. The results showed by [12] report that COIL positively influences intercultural awareness and promotes personal and professional development. In this regard [13] investigated the relationship between emotional intelligence, self-regulation, and student performance in COIL, finding that self-regulation partially mediates the effect of emotional intelligence on academic performance. These studies collectively emphasize COIL's potential to enhance intercultural competencies, global engagement, and academic outcomes while also highlighting the importance of considering cultural differences and emotional factors in designing effective COIL experiences. According to the researchers, more work is needed in this area, creating activities before the sessions begin to encourage interaction, and other strategies during the experience, to monitor the interaction between the students from both countries, aiming to make any necessary changes on time.

Although the feelings experienced by the students are not a criterion that is currently integrated in the evaluation of

intercultural exchange experiences, it is always recommended to assess this factor, since the students are exposed to a situation that is very different from the usual teaching practices, which also requires them to have different skills than those normally evaluated.

On the other hand, both the infographic and the video were positively evaluated as interesting assessment tools. However, in the case of the infographic, it would be necessary not only to show examples but also to emphasize the main aspects that need to be considered when designing one. This gap was identified in the assessment of the instrument. Nevertheless, is very important to integrate standardized instruments for assessing intercultural competencies, collaborative learning outcomes for next cohorts.

Respecting the assessment instruments, other studies employed various instruments to assess COIL activities across different studies. The research in [14] utilized the Social Networking Approach to evaluate students' linguistic, cultural, and global social competencies. Gray implemented pre- and post-assessments to measure cultural learning and cross-cultural ambivalence [15]. In [16] it was used a quasi-experimental design with pre-post surveys incorporating the Cultural Intelligence Scale (CQS) and Multicultural Personality Questionnaire (MPQ), complemented by qualitative data. Other study employed a questionnaire to assess cultural competence, collaborative learning outcomes, subject-specific outcomes, and overall course satisfaction [17]. The diverse assessment methods reflect the multifaceted nature of COIL activities and their outcomes in higher education settings.

Another interesting aspect to consider is the students' commitment to the COIL activity, in terms of attending all sessions, completing the designed activities, and, if possible, providing feedback on the most noteworthy aspects. For Colombian students, achieving this commitment was more challenging as it was a preparatory course.

Regarding the design of the activity itself, the researchers concluded that synchronous sessions could be reduced to facilitate coordination given the different time zones between participating countries. These synchronous sessions would be replaced by asynchronous group activities that allow for progress on the topic using some collaborative work tool, with comments from the guiding professors.

Based on all the results obtained, several adjustments will be implemented in the session planning for the following cohorts, regarding the communication channels between instructors and students, bettering clarity in the assignments and its assessment criteria.

Having in mind some previous works about COIL integration into curricula in engineering education contexts, this study contributes to the innovative practices drawing attention on the emotional experience, giving some insights about how this aspect could impact the practice. Finally, it is important to highlight that this experience attracted the attention of other universities, which have decided to join this activity, posing the challenge of conducting it with four participating countries (Chile, Colombia, Argentina, and Mexico).



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