The Global Classroom experience, a didactic strategy to develop skills through Project-based learning. Lessons learned between Mexico and Chile in a multidisciplinary development on Food Science

Rebeca García-García, PhD[1], Ingrid Contardo-Hernández, PhD[2], Makarena Ruíz-Acin, PhD[2], Amanda Ramos-Trujillo, LNB[1], Viridiana Tejada-Ortigoza, PhD[1], and Jorge Membrillo-Hernández, PhD[1]
[1]Tecnologico de Monterrey, México, rebeca.garcia.garcia@tec.mx, aramost@tec.mx, viri.tejada@tec.mx, jmembrillo@tec.mx,
[2]Universidad de los Andes, Chile, icontardo@uandes.cl, mruiz@uandes.cl

***Abstract*– A Collaborative Online International Learning (COIL) program was carried out involving a Nutrition and Nutraceutical course at Tecnológico de Monterrey, Mexico, and a Food Technology laboratory at Universidad de Los Andes, Chile. The objective was to potentiate the learning experience of students at both institutions to work together in the challenge of developing front-of-pack nutrient warning label food while applying acquired knowledge and strengthening teamwork and negotiation skills in a multicultural and international environment. Engagement strategies and social interaction were used to enhance the collaboration. During the challenge, the students applied and developed technical skills, whilst developed soft skills like teamwork and adaptability in multicultural context. Students at both institutions showed a high degree of satisfaction from the collaboration and brought them closer to a professional setting.**

***Keywords*—COIL/Global classroom collaboration, teamwork, multicultural environment, Professional Education, education innovation, higher education.**

I. Introduction

As globalization and rapid technological advances continue to transform the world of jobs, there is a need for graduates to work in intercultural environments, more connected to the realities and needs of global economies and societies. Employers seek students who are effective global citizens, able to navigate new contexts with multicultural diversity, work in multicultural virtual teams, maintain social cohesion, promote sustainability, and be agents of positive change. These skills can be widely incorporated in experiential and challenge-based global learning environments. In the context of job disruption and increasing polarization, Higher Education institutions have a critical role to play in preparing global citizens and the workforce of the future.

The new educational models of the Fourth Industrial Revolution, Education 4.0, must be adapted to equip future workers with the necessary skills to create a more inclusive, cohesive, and productive world. New communication technologies can enable global citizenship education. Virtual classrooms and video conferences, for example, can connect young university students from classrooms in various parts of the world, allowing them to exchange ideas and learn about global challenges through different lenses, perspectives, and cultures.

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Higher education institutions can promote global citizenship learning by setting clear international standards. The Collaborative Online International Learning (COIL) is the joint development of a shared curriculum by two or more instructors from geographically distant locations and is an innovative way to engage students in a shared, multicultural and collaborative online learning environment [1].

Active learning such as Challenge-based (CBL) and Project-based learning (PBL) are defined as teaching methods in which students gain knowledge and abilities to work in solving important challenges [2, 3]. When the students can relate course content to get solutions to real-life challenges, they increase their knowledge, strengthen their skills, and maintain interest in the subject. There is evidence regarding successful results when PBL is applied in combination with other tools such as information and communications technology, achieving important learning outcomes in science and engineering courses [4]. In addition, the use of different online tools such as Slack, Padlet, Zoom, and Google Teams, among others, increases the effectiveness of online collaborative learning and facilitates the communication between work teams [2].

The Tecnólogico de Monterrey (TEC) in Mexico, and Universidad de Los Andes (Uandes) in Chile, have established a COIL where two undergraduate courses, Nutrition and Nutrigenetic (5th semester) from the Department of Bioengineering at TEC, and Food Technology Lab (3rd year) from the School of Nutrition and Dietetics at Uandes, have partnered to develop a join project-based collaboration, taking advantage of multiculturality and course complementarity. Thus, the objective of this study was to potentiate the learning experiences of students at both institutions, the challenge consisted of developing a food without front-of-pack nutrient warning label, while applying and comparing acquired knowledge and strengthening intercultural communications skills in a multicultural and international environment.

II. METHODOLOGY

A. *Global Classroom (GC)*

It is an initiative of the Tecnologico de Monterrey with a course from an international partner university, through a digital environment, using technological tools to connect students in collaborative activities that promote learning in multicultural environments. Its mission is to generate internationalization experiences with significant learning, linking the student to a multicultural, collaborative and knowledge-integrating environment.

Learning in multicultural environments is possible for virtually all schools. Through a digital environment and using the appropriate technological tools, we can connect students around the world in collaborative activities that promote diversity, inclusion, and appreciation for other cultures and their own. Through Global Learning, students identify, analyze, discuss, and develop proposals for solutions to real problems in an international context; fostering an ideal environment to develop key skills for global citizenship and for employability.

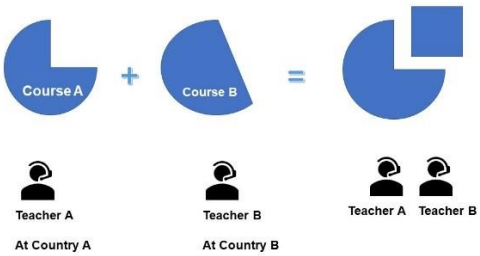

Fig.1. During the planning period of the Global Classroom, professor A, responsible for course A in his country A, agrees with professor B, responsible for course B in his country B, through strategic planning meetings to jointly hold joint sessions and adapt the part of the course that corresponds so that the hybrid class between the groups have the same theme.

The Global Classroom aims to link, partially or totally, a course of the institution with another course of another international foreign university. It is based on the Collaborative Online International Learning (COIL) methodology developed by Jon Rubin at the State University of New York (SUNY). This initiative makes it easier for teachers to innovate in their teaching practice while encouraging curiosity in their students with a desire to learn and expand their vision regarding different situations present in their environment and around the world. Through the exchange of ideas and opinions, stereotypes are broken and a valuable dialogue between different cultures is given rise.

There is a planning period prior to the beginning of the semester, where teachers agree to examine the possibility of carrying out a global classroom experience. This period is crucial because teacher A from Country A establishes contact with teacher B from country B, the courses within which the Global Classroom will be held are established, the demographic analysis of the students in each group, number of men, women, semester in which they are enrolled, careers they study, etc. After agreeing on the course, the topics to be developed, common evaluation rubrics must be designed for the participating groups (Fig. 1).

Sometimes it may happen that the courses are in different languages, where it is usually preferred that the courses be in English, another detail is if the difference in time use is huge, the most appropriate schedules for both groups having synchronic meetings are established (Fig.1,).

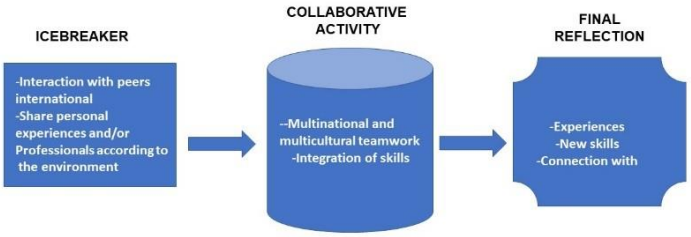

Fig.2. The Global Classroom experience is based on COIL (Collaborative Online International Learning), a teaching and learning methodology developed by Jon Rubin at the State University of New York (SUNY). It consists of three moments: Icebreaker, Collaborative and multicultural work and finally a personal reflection on what was learned during the experience.

On the other hand, it is very important to establish that participation in the activities must represent a percentage of the final grade. Each professor defines the corresponding percentage for his course, the weighting. The Global Classroom must be of at least a minimum duration of four weeks, extending if the teachers decide according to the established learning objectives.

Tec Global Classroom promotes the development of transversal skills such as:

Intercultural communication

Critical thinking

Global citizenship

Collaboration in multicultural teams

Adaptation to virtual work environments

Use of technologies

Effective collaborations with other universities

For a collaboration to be effective, it must meet the following basic requirements (Fig. 2):

A) An icebreaker activity

B) An activity focused on collaborative work in multicultural teams

C) A final individual reflection

Once the professors of the participating institutions design the learning activities together, the aim is for the students to have a common platform to carry out interaction and teamwork synchronously or asynchronously through technologies such as Google Sites, Slack, Zoom and Padlet.

In Google Sites, teachers design a website that serves as a bridge to link their respective courses for their particular collaboration, regardless of the learning platform that each institution uses (Canvas, Blackboard, Moodle, etc.). Google Sites in a simple way, allows teachers to publish the details of each of the activities to be carried out. Once the site is ready, students can access the information through a personalized link for collaboration.

Slack is an instant messaging tool that allows you to create private workspaces with group or individual communication channels. It also allows file sharing and the integration of other services or collaboration tools. For students to join the workspace created by teachers, it is only necessary to register with their institutional email account.

For synchronous communication, teachers and students use the Zoom tool to schedule video conferences, make presentations or share ideas. Zoom sessions can be recorded for evidence or for later reference.

Padlet allows the creation of virtual whiteboards where users can share content in different formats such as video, audio, text, images, presentations and more. One of the initial activities during the collaborations is an icebreaker or icebreaker where each of the participants shares a short presentation video so that later the colleagues of the international counterpart can comment on it and exchange ideas and opinions.

It is worth mentioning that there are many other free tools or under a licensing scheme that can be used to facilitate collaboration. The selection of the most appropriate tools depends on the objectives and the design of the learning activities.

B. Project-Based Learning (PBL) Methodology

Applying PBL the teaching team decided that a seal-free food product would be developed. Ten Teams of up to six students from both universities were created and they worked together throughout the semester. They applied their knowledge of food science and technology and nutrition concepts to resolve the challenge. There were two restrictions to develop food were that 1) the product had to be free of front-of-pack nutrient warning label; and 2) the product had to be for a target population. Each project had to cover the followings topics:

1) Description of the specific target group
2) Unit operations and conditions for the food processing
3) Food ingredients and functionality
4) Labeling
5) Nutrition facts label

Projects were evaluated through four components: a) progress reports, b) infographics, c) short presentations, and d) a final report including the feedback provided during the semester.

B. Collaborative Interactions

Periodic synchronic Zoom meetings were held to give instructions, answering questions, and work planning. Moreover, team members have been in communication through Zoom, WhatsApp and Google Drive. Intercultural activities were organized to discuss about traditions and typical meals in each Country (Mexico and Chile), and similarities and differences in both institutions. Prior starting the collaboration, students introduced themselves by uploading a video on Padlet and posting comments on other students' posts. Likewise, at the end of the collaboration, students uploaded a final reflection on their personal experiences.

C. Assessment of Student Progress and Satisfaction

Students' final projects and participation were evaluated with a rubric that included formative and disciplinary components. The final evaluation of this project granted 90% of the final grade for the course. Also, throughout the collaboration, the students were surveyed in relation to satisfaction with the professors, activities, and interactions within team members. In these surveys, they were also given the opportunity to propose new ideas for activities and improvements in the collaborative environment. Furthermore, the instructors held frequent meetings to organize the activities.

III. Results and Discussion

COIL has been defined as an approach to teaching rather than a technological platform. It has demonstrated to foster efficient interactions between students at different locations and not only improve but also enhance collaboration, intercultural skills [5], and multidisciplinary teamwork.

The disciplinary knowledge and skill goals of the courses were accomplished due to the PBL. Throughout the COIL program and during the final evaluation, not only professionalism, oral and written communication, and other formative skills were assessed. Nutrition concepts,

comprehension of the nutrition label guidelines from both countries, new product development strategies, and specific target group nutrition needs were assessed as well. The average grade on these projects was 84/100; this being 90% of the final grade of the course. All the students achieved a passing grade (above 70) on their courses and most of them had a great performance during every activity.

At the end of the semester, it was crucial to know the students' feedback about the interactions and evaluate the COIL experience. After the presentation of the final project, students answered a survey (Fig. 3). The results showed that the students "are strongly agreed" and "agreed" with the overall collaboration and communication with people from different cultures, adaptability to an international context, and increased awareness about global issues.

Fig. 4, shows the students satisfaction with the COIL experience. Mainly, they were strongly satisfied with the COIL experience and interactions with professors and would have liked more interaction with the international classmates. Finally, the last question in the survey was if the students will recommend another student participate in a COIL experience. The answer (Fig. 5) was positive since 88% of the students would recommend it. However, 6% would not recommend the COIL experience. This answer could be due to the desire of the students to have more interactions with their international counterparts, or because they had problems with their schedules to set the meetings. It is important to highlight that, at the beginning semester, Chile had an hour ahead than Mexico, and at the end of the semester Mexico changed to the wintertime that resulted in three hours difference between Chile and Mexico. Because of this, meetings out of class hours had to be held.

The surveys included not only multiple-choice questions (i.e., agree, strongly agree or disagree) but also open-ended questions for students to express their ideas in a freer way. Herein, a very interesting insight into the collaboration was gained. Both students, at TEC and Uandes, were taking courses at junior level.

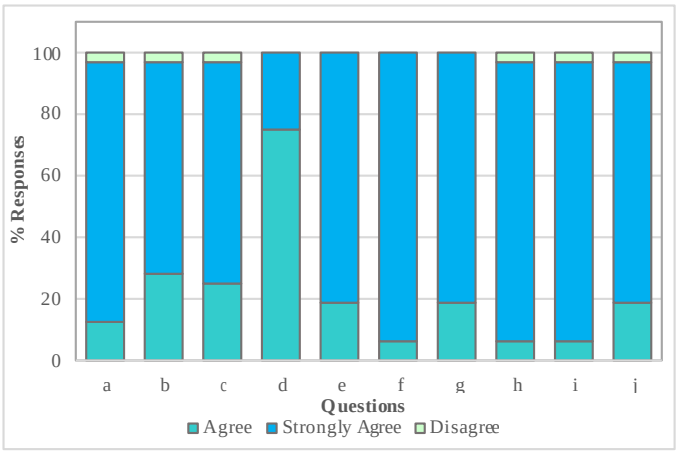

Fig. 3 Survey responses performed after the final presentation. **a** Participate in another COIL; **b** Look for other international and intercultural opportunities; **c** COIL increased my understanding of how the academic or professional field is approached in different cultural contexts; **d** COIL increased confidence by using technologies that allow communication; **e** COIL expand my understanding of other cultures; **f** COIL helped me develop my ability to: accept similarities and differences with other cultures; **g** COIL helped me develop my ability to adapt efficiently in any international and intercultural context; **h** COIL helped me develop my ability to communicate effectively with people from different cultural backgrounds; **i** COIL helped me develop my ability to work productively with people from different cultural backgrounds; **j** COIL helped me develop my ability to raise awareness about global issues.

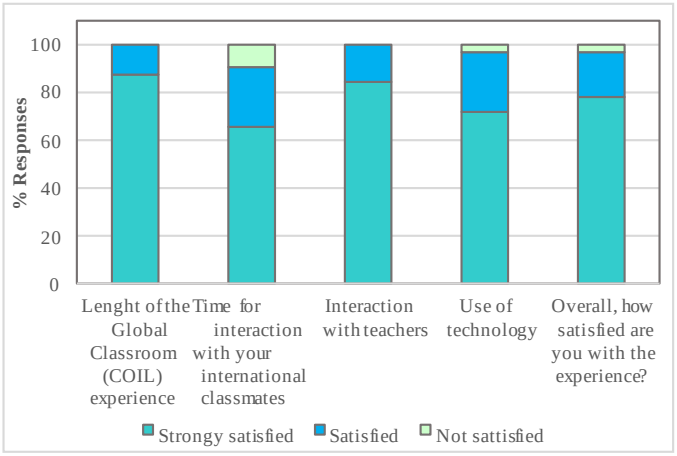

Fig. 4 Student responses to the evaluation of COIL experience satisfaction.

The former felt they benefited from the experience of the latter in writing reports and doing literature research for both countries. Students in Chile expressed benefitting significantly from their counterparts concerning Mexican laws, learning about the ingredients and laws for food production. TEC students also learned about labeling laws, ingredients, and regional foods in Chile. Interestingly, the majority realized that by explaining their knowledge to their teammates from the other institution, they were able to consolidate and more deeply understand topics covered in their respective courses. Furthermore, this process was more effective due to the social

activities, which helped them feel closer and more confident to share their experiences.

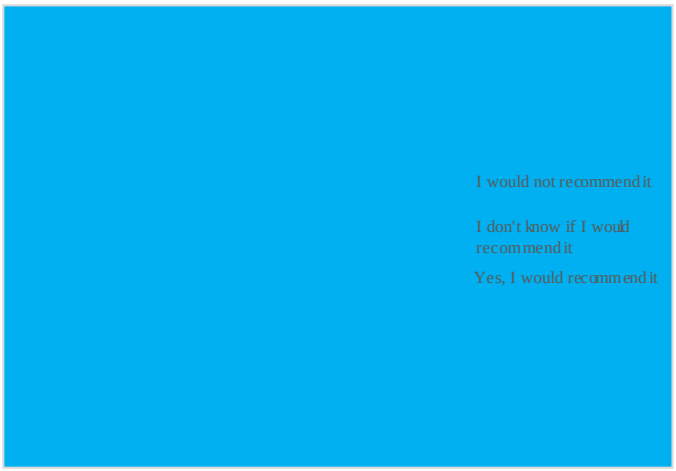

Fig. 5 Student responses about the COIL recommendation.

IV. Conclusions

In this report between universities in Mexico and Chile, it is evident that the objectives of the Global Classroom are met satisfactorily, however, we must note that each GC experience has its particularities, and it is the job of the teachers to make the experience a memorable adventure.

The objectives of promoting global learning by exposing the student to real problems in an international context, allowing the development of skills, promoting diversity, inclusion, and appreciation for other cultures and their own; as well as enabling internationalization and linking professors, generating opportunities for professional development and research with international colleagues, are met satisfactorily. Our KM strategy generated internationalization experiences with significant learning, linking the student to a multicultural, collaborative and knowledge-integrating environment.

COIL combines the four essential dimensions of virtual mobility: it is an exercise in collaboration between teachers and students; makes use of technology and online interaction; it has potential international dimensions; and integrated into the learning process. The CG experience is a didactic strategy that we could establish as Win-Win for all participants:

Benefits for students:

International experience

culture exchange Skills

development

Significant learning

Benefits for professors:

networking opportunity

Development of teaching skills

Promotes the achievement of learning objectives

Supports the development of skills

Differentiator in the courses

Benefits for educational institutions:

Strengthens the relationship with strategic partners

Aligned to institutional strategies

Complements other international experiences

Highly replicable and flexible

Positioning and differentiator

In conclusion, the lesson learned is that these didactic exercises can enhance meaningful learning, create a global perspective and, above all, are a successful alternative to times of confinement such as the one we are experiencing in 2020 and 2021. Disciplinary competences were also achieved, evidenced by the results and grades of the different evaluations applied during the COIL program and the course.

More pedagogical studies are required to improve the Global Classroom and adapt it to different situations but reports like this will serve as a basis for it.

Under the COIL program, TEC and Uandes implemented a project-based learning approach to make students of their courses Nutrition and Nutrigenomic and Food Technology Lab respectively, produce seal-free food. It became very clear that these collaborative processes should be flexible in many concerns and that continuous assessment is important to optimize the experience.

Our mission now will be to adapt our courses [6-9] that are designed in the Tec21 model, with the challenge-based learning strategy, to a Global Classroom system to expand the skills and benefits of this new academic strategy. The introduction of learning and engagement strategies through greater social interaction enhanced the collaboration. This allowed students to develop not only important technical skills, but also soft skills, such as intercultural sensibility, teamwork, and adaptability to

international contexts. Perhaps, these are the most valuable takeaways for students who will have to perform in an increasingly global work environment. It is important to note that Global classroom was a very useful didactic tool in the times of the COVID-19 pandemic, neglecting the development of skills and generating new knowledge that will serve students in their future jobs.

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