Brazil, France, and the USA: A Multidisciplinary Cross-Continental Approach Teaching Global Sustainability Mastery Skills for Impact

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Abstract

Can a global sustainability problem-solving competence be significantly increased through a structured Intercultural Virtual Collaboration (IVC) team project work environment, using technology? What may be the framework that contributes to developing awareness and discourse to initiate innovation and solutions to current sustainability issues?

The rationale behind this multidisciplinary and cross-continental project is to move from the development of intercultural competence to that of "global or intercultural citizenship [that] borrows from models of citizenship education to refer to the application of these competences to actively participating in, changing and improving society" (O'Dowd 2019). There is a worldwide need for culturally competent talent that can successfully function in a dynamic and multicultural global marketplace while possessing the understanding, skills, and experience that cannot be gained in a traditional classroom setting (Abrahamse et al. 2014). Tackling the issue of sustainability, a highly interconnected notion of today's world, does not only require students to use their acquired knowledge in their respective fields of expertise, it also demands critical understanding of the world (Leask, 2015).

Our aim is to broaden students' world perspectives through engagement in problem-solving in intercultural, virtual, interdisciplinary work teams across borders, time zones and cultures. Our multidisciplinary collaborative project facilitates virtual collaboration between students from Brazil (an intercultural communication course), France (a double-major in science with emphasis on the English language) and the USA (an interdisciplinary sustainability and climate resilience capstone course).

We will share our assessments and outcomes while integrating concepts across disciplines using research, discourse and reflectiveness, assessing cultural and value consciousness, applying critical and creative thinking, and a holistic approach and perspectives. We will share how the learning experience enables students to develop a broader awareness of a wide range of issues relevant to our future sustainable society.

INTRODUCTION

This model, research and data collection create and validate a model for preparing tomorrow's leaders to undertake global sustainability initiatives. The proposed model facilitates the process of problem-solving across borders, cultures, and disciplines. Our approach suggests creating an environment that simulates the global multinational environment, utilizing intercultural virtual

teamwork collaboration across borders and disciplines in order to formulate change, progress and come up with new solutions for existing as well as tomorrow's issues. The sustainability challenges are addressed through developing effective intercultural solution-oriented interactions, problem solving activities, critical thinking, teamwork, and a global leadership approach. This all while utilizing higher education institutions around the world as a lab in a complex global reality, and fostering experiences that develop skills for competitiveness. The deliverables mimic the workplace and/or organizational demands, and the students' engagement in problem-solving and creating solutions forms the base of our approach, emphasizing that task execution depends on their interactions, worldview and goals.

The main objective of the research herein described is two-folded: first, we propose a model to serve as a platform to train and equip higher education students across disciplines, borders, and cultures working in teams, to improve awareness, cultivate skills in thinking critically, and develop knowledge and skills base to shorten the learning curve and accelerate sustainability solutions. Second, we analyze how cultural differences may interfere with students' perceptions of the learning experience using survey data collected from the participants.

In our study and sustainability model validation, we will assess how valuable these learning experiences are for developing the skills for tomorrow's leaders to be able to work globally on sustainability solutions across industries, disciplines, borders, and principles, while collaborating in teams.

THEORETICAL BACKGROUND

The increasing degree of interculturalization in organizations across the world has necessitated the development of new competencies for professionals entering the corporate world. Global businesses constantly rely on cross-border collaboration through virtual teams to attain common goals (Pearlson & Saunders 2006). This prominent feature of the contemporary corporate world mandates cultivating the ability to operate in virtual environments with individuals from various cultural backgrounds to implement and deliver products and services across borders. This, subsequently requires the development of these skills in higher education by offering students a more practical and holistic perspective on new socio-cultural and technological demands (Rutkowski, Vogel, van Genuchten and Saunders 2008).

For companies to flourish, their perspectives and operating principles should be globally oriented toward higher profits. The success of tomorrow's economies depends on the development of a global mindset and strategies to bridge the widening gap between domestic and intercultural opportunities. This demand for a global mindset is reflected in the increased need to work in virtual multicultural teams across borders, time zones, and cultures (Pearl 2011).

In response to the increasing demand of employers for globally prepared graduates, several institutions of higher education have implemented strategic goals aimed at enhancing interculturalization. Both employers and educators promote the importance of global and intercultural competence in ensuring success in the modern-day workforce (Gatlin-Watts, Carson, Horton, Maxwell, and Maltby 2007).

There has been a considerable increase in interest and research applying the complexity theory in business management. This complexity in the business environment can be attributed to the enhanced competition, incredible pace of technological innovations, and interculturalization of firms, among other factors (Vasconcelos and Ramirez 2011). One of the most significant characteristics of complexity theory is the relationship between its elements, which results in

unpredictable responses and, simultaneously, in a self-organized system. This typical behavior of a complex adaptive system (CAS) leads some researchers to suggest a network-centric complex-system to explain, for example, the interculturalization process of the firm (Chandra and Wilkinson 2017). Based on this setting, it is crucial to consider the emerging role of higher education, and especially business schools, in a complex environment in order to not only supply capable workforce but—primarily—to continue to observe, learn, and understand the global business arena that can help support companies in their sustainable development and growth.

The World Economic Forum (WEF) focuses on many aspects of sustainability and features several platforms stating that we are living in a more complicated and fast-changing world with interconnected problems and challenges. Businesses, governments, and civil society are undertaking initiatives to define these problems, search for solutions and take action. But how do the world's efforts to address these challenges feed into interconnected global systems, or attract wider public attention for more impact?

The 4th industrial revolution, introducing adaptiveness in the economic, social, and business world, generated a context that requires the management of complex adaptive systems and expanded, in the field of superior education, the need of reflection driven learning to deal with adaptiveness (Belohlvaek 2018).

Complexity can be defined as the degree of diversity in an environment, with elements or agents such as customers, suppliers, governments, regulatory agencies, employees, and technology (Adcroft and Mason 2007) interacting with one another, resulting in unpredictable actions and reactions, and constantly leading the system to a new status. Due to these interactions, the system spontaneously evolves into a self-organized structure. This further results in another important characteristic of a complex adaptive system (CAS)—the possibility, at the edge-of-chaos, of locating conditions to maintain the current status quo and finding others capable of leading the system to a new status quo through creation and innovation (Manson 2001).

Transposing these concepts to our sustainability experiential teaching method and the intercultural business pedagogic environment, we suggest that a school serves as a CAS after it acts as a social system influenced by several external and internal factors that, subsequently, generate unpredictable actions and reactions and stimulate the emergence of a new status for the system, or better, for the school. According to these researchers, if schools are identified as social CAS, it is easier for the educational organization to identify some of the challenges to starting and sustaining transformations in schools (Fidan and Balcı 2017; Keshavarz, Nutbeam, Rowling, and Khavarpour 2010) and to further continue supporting industries to develop their businesses.

Intercultural collaboration is an important driver of innovation (Luukkonen, Persson and Sivertsen, 1992; Wagner and Leydesdorff 2005) and it leads to challenges related to the adaptation of communication, teamwork, and decision-making patterns. Moreover, conflicts are more probable in intercultural environments (Montoya-Weiss, Massey and Song 2001). The increasing level of interculturalization in companies has necessitated the development of new competencies for professionals entering the corporate world. Global businesses and organizations are relying ever more on cross-border collaboration through virtual teams to implement and deliver products and services across borders (Pearlson and Saunders, 2006), thereby necessitating in their recruits the ability to function in remote environments with people belonging to various cultural backgrounds. To develop these skills, hence, students should be offered an updated perspective on new sociocultural and technological requirements (Rutkowski et al 2008).

Stefan Crets Executive Director sustainability Europe states: “Collaboration is vital to pursue the systemic changes needed in society and within business to achieve the Sustainable Development Goals” ("Collaboration for Impact Maturity and Integration of Sustainability in European Sector Associations" 2018). One such example for sustainability collaboration is in Europe, where the leading European business network in corporate sustainability and responsibility works together across industries and borders. With their corporate members and national sustainability organizations, they unite, inspire, and support over 10,000 enterprises at the local, European, and global levels. They support businesses and industry sectors in their transformation and collaboration towards practical solutions and sustainable growth. They are for systemic change; therefore, they co-build with the European leaders and stakeholders an overarching strategy for a Sustainable Europe 2030. Collaboration is vital to pursue the systemic changes needed in society and within business to achieve the Sustainable Development Goals. We believe, and there is a growing body of evidence, that sector and multi-stakeholder partnerships have the potential to raise the integration of sustainability on the agenda, which will lead to new business opportunities and enhanced competitiveness (“Collaboration For Impact Maturity And Integration Of Sustainability In European Sector Associations" 2018).

According to Santillo (2007) what passes as definitions of sustainability are often predictions of actions taken today that one hopes will lead to sustainability. Combining this concept structure our approach, we suggest a model that prepares tomorrow’s leaders to undertake global sustainability leadership through collaborative teamwork across borders and industries and be equipped to formulate change, progress, and come up with new solutions for existing as well as tomorrow’s issues.

Interculturality, sustainability and experiential learning

One way of addressing these needs while promoting active learning is through intercultural collaboration via virtual classrooms, which have been established since the popularization of the internet (Harasim, Hiltz, Teles, and Turoff, 1995; Hiltz 1994). In the traditional manner, students can acquire any theories, concepts, and constructs that form the core of an academic discipline simply by perusing the relevant books and articles, watching lectures, and through memorization and practical exercises. However, a more comprehensive understanding only emerges when such theoretical knowledge is confronted with a more tangible approach utilizing practical experiences and problem-solving skills; for example, when undertaking activities in teams. Thus, the constraints of the classical approach to education (the lectures—exercise—examination chain) become evident—it oversimplifies learning experiences and does not promote thorough comprehension (Pearlson and Saunders 2006).

Sustainability can be engaging and empowering. It allows students to assume responsibility for their actions and to contribute their vision for a sustainable future. However, their perspectives may be limited to, and influenced by, the city/country in which they reside. Our experience facilitates their expansion and development of knowledge and skills, beyond their familiar borders, improves their awareness of values and motivations for action, as well as allows them to develop their own wellbeing—and that of their community and the planet—in an increasingly interconnected world.

Although sustainability principles are often used and applied at a micro level, it is important for students to recognize that sustainability can only be truly achieved at a global scale. The growing economic interdependence among countries and the intense flow of merchandise and services around the world amplifies the effects of human activity through a chain of consequences that

spreads worldwide. This concern has been a verified along time throughout the several endeavors that generated the Sustainable Development Goals by the United Nations (2020).

According to UNESCO (2010), issues related to the environment and socio-cultural consequences of globalization have been systematically minimized and overlooked. The consequences of this are the intensification of environmental degradation as well as the burst of social conflict both within and across national borders. Therefore, intercultural understanding and respect for cultural diversity form the basis for inter-linkages between the various sustainability dimensions (UNESCO, 2010).

In this sense, teaching sustainability using an intercultural virtual collaboration approach has the potential to enhance the understanding of such complexity and increase students´ awareness of sustainability issues in a broader context (Salgado-Orellana et al., 2019). Nevertheless, working on such a controversial topic in multicultural groups may add an extra layer of complexity that could turn it even harder to manage and, as a consequence, generate the exact opposite effect. It is, then, necessary to include intercultural education as a part of the teaching and learning experience, in order to achieve optimal results (Kyurova and Kiryakova-Dineva 2019).

Higher Education as A Preparation & Training Ground/Lab

Experiential learning is integral to effective intercultural business teaching, particularly since it offers students the opportunity to consider highly contextual situations they do not usually encounter. Ramburuth and Daniel (2011) focused on case-study teaching, while our project adds an additional level that provides students with a full-fledged, multi-phase project collaboration between international universities that incorporates the efforts to understand, discuss and solve sustainability challenges. In this context, the intercultural virtual collaboration among schools appears to be a faster, cost-effective, and more efficient platform to accelerate the adaptation of these organizations to an intercultural and complex environment. Through virtual collaboration, the primary aspects of a CAS—such as the spontaneous responses among the students or professors solving problems—can be observed, representing the unpredictable actions and reactions toward a self-organized structure. This subsequently establishes the organization’s new status quo, in this case, the class and working teams representing the emergence of new conditions. Based on this, it is expected that this platform accelerates the acquisition of practical knowledge of the students, thus preparing them for solving sustainability challenges across borders.

Universities offer courses to prepare students for the globalizing world. Increasingly, intercultural competence is considered an important skill to be acquired from undergraduate education. Since intercultural collaboration is challenging for many, there is a need to develop and implement alternative means for incorporating intercultural and cross-cultural experiences in the undergraduate classroom. There is a worldwide demand for culturally competent talent that can function optimally in a dynamic and multicultural global marketplace and capitalize on the understanding, skills, and experience that cannot be gained in a traditional classroom setting (Abrahamse et al. 2014).

Intercultural virtual teamwork collaboration offers students a concrete experience that requires open-mindedness and adaptability, reflective observation, abstract conceptualization, and active experimentation. Students reflect on and critically examined their experiences from multiple perspectives, developing logic and reasoning to understand situations, forming abstract concepts to be tested, and applying the knowledge gained to make and test predictions in new situations (Ramburuth and Daniel 2011).

METHOD

The climate and its impact on our planet and civilization is a defining challenge of the 21st century. Sustainability and climate resilience are highly significant, and organizations and communities across continents should be managed in a way that ensures that this planet remains habitable. The main challenges we identified and addressed for organizations, as well as countries to plan, design and implement successful components of the sustainability are as follows:

- Find solutions across industries, countries, regions, and cultures, which requires collaboration.
- The need for a a global and intercultural approach, deploying global and cultural competence, as well as the ability to communicate and reach agreements/deliverables within the work teams.
- Insufficient people are skilled and experienced, and the available expertise is usually limited to a certain country, discipline, or ranks of management and higher.

We integrated within the sustainability and climate resilience focus the practice of interdisciplinary research, discussions, analysis, and problem-solving in a Collaborative Intercultural Virtual Exchange Teamwork. The driver was to add practical experience to the theoretical framework. Using this approach, combined with the project deliverables, helped facilitate teamwork collaboration, solve problems, and suggest a functional work structure across language barriers, cultures, and time zones. In this project, we considered technology as a facilitator of communication and not merely as a tool that may resolve challenges. The predominant objective is to enhance the students' worldview, perspective development, and mastery of sustainability and climate resilience issues throughout the course, using the following tools/methodologies:

- Longitudinal study
- Virtual teams of multiple universities, disciplines, and cultures
- Dependent measures: Cross-cultural competence survey/assessment, teamwork, and sustainability
- Modular assignments that measure/check progress on topics, interactions, and views from individual aspects—introduction—to full team/group collaboration; we structured stages in creating teams and ensured an increase in communication and intercultural exposure.
- Quantitative data
- Qualitative data

QUALITATIVE METHODS - PLANNING AND EXECUTING THE GLOBAL LEARNING EXPERIENCE

The Learning Program

Each week for the duration of the collaboration, the students engage in teamwork, problem-solving and brainstorming, joint research, sharing perspectives, cultural evaluation and analysis and will work on the project/deliverable of the course. The elements that compose the program are:

1. A common connecting topic: Sustainability & Climate Resilience
2. An Intercultural Competence Model, to serve as a conceptual reference;
3. A related list of learning outcomes expected from students by the end of the program;
4. A sequence of tasks to be held during a period of collaboration weeks;
5. Use of diverse technology tools to facilitate communication and collaboration;
6. An assessment plan.

This study involved the following disciplines:

1. A sustainability and climate resilience capstone course from the US
2. An intercultural communication course from Brazil
3. A double-major in science with emphasis on English as a second language from France

Research Study Components

Our lab environment, focused on sustainability, following the underlying concepts of Complexity Theory, Intercultural Global Virtual Collaboration, and problem-solving needs, includes the following:

- Classrooms in virtual and face-to-face settings in Brazil, France, and the US.
- Projects comprising of rounds of collaboration between students from all involved universities. The collaborations serve as a useful framework for developing further projects for empirically teaching sustainability. This study emphasizes teamwork deliverables, imitating the intercultural business setting and the challenges that global businesses and organizations face.
- Focus is placed on the practical skills instrumental to successful global virtual teamwork. Based on participants' experiences in these virtual team projects, our recommendations emphasize relationship building, the importance of cultural competence, the need to create an inclusive teamwork process, and the significance of problem-solving, task accomplishment, and balancing individual control with shared objectives.
- This experimental research study also lays the foundation for a higher level of preparedness to engage in the global corporate world and serves as a platform for corporations to develop a more relevant synergy with universities and maintain a two-way communication to explore global trends and new skills and tools that should be made available to students. Furthermore, our findings suggest and curate a training program aimed at developing a proven process to engage corporate professionals while enhancing their cultural competence (CQ).

Research Tools

The following research tools are used to evaluate the success of the program:

- Create a virtual global collaboration lab to involve several universities from different countries, with multidisciplinary backgrounds for the students, a variety of cultural backgrounds, problem-solving approaches and different knowledge-base in order to simulate the global sustainability environment.
- Qualitative: Discussion prompts to measure exchange of knowledge and teamwork dynamics.
- Quantitative: Assessments to cover cultural competency, teamwork, and interactions, administered pre- and post- research experiment.
- Observations: Professors assess the current experiment and develop an effective process for initiating it, as well as the best practices, according to the students' responses in their discussions, the quality of the papers, effectiveness of the interactions, and impact of other virtual exchange tools developed and implemented.
- Course teaching objectives and learning outcomes are measured against their successful achievement and mirror practical tasks in sustainability management; furthermore, the role of the intercultural virtual team collaboration in achieving these is examined and students can graduate with practical experience that will contribute to their employability.

Phase 1: A preliminary, empathy building phase. The ice-breaker activity consists of an information exchange task and intra team introduction in an asynchronous format. Learning outcomes of week #1 and the icebreaker, students should be able to:

- Recognize the main cultural characteristics in their counterparts;
- Understand the importance of flexibility and openness when working in multicultural environments;
- Develop strategies (handbook/instructions for communication) to establish effective communication with people speaking different levels of English.

Phase 2: A central phase devoted to content related activities. Asynchronous assignment – Agree on topics and scope within the intercultural virtual team.
Phase 3: A reflection phase.

QUANTITATIVE PHASE - MEASURING STUDENTS PERCEPTIONS

For the quantitative aspects of this study, we measured the cultural differences among the three different groups according to Hofestede's cultural dimensions. For that, we considered only his original study, in which four cultural dimensions were identified: (i) Individualism vs. collectivism; (ii) masculinity vs. femininity; (iii) power distance; and (iv) uncertainty avoidance. The questions for this measurement were based on VSM 2013 (Hofestede and Minkov, 2013). We also measured the projected impact students would foresee of different variables over their team effectiveness. The questions considered the following variables:

a) Time Zones
b) My Self-Confidence
c) Lack of Engagement
d) Cultural and Language Challenges
e) Gaining A Shared Understanding of Goals and Tasks
f) Managing Conflict from A Distance
g) Deciding on Roles and Responsibilities
h) Adhering to Deadlines
i) Modes of Communication/Technology
j) Providing Feedback
k) Achieving and Maintaining the Necessary Levels of Trust between Team Members
l) Conflicting Priorities
m) Building Relationships
n) Work Ethics and Work Styles
o) Stereotypes

We also used the Cross-Cultural Competence Inventory to measure students' evolutions over the tasks. After data collection, the results were submitted to ANOVA statistical analysis in order to identify significant differences among the research constructs.

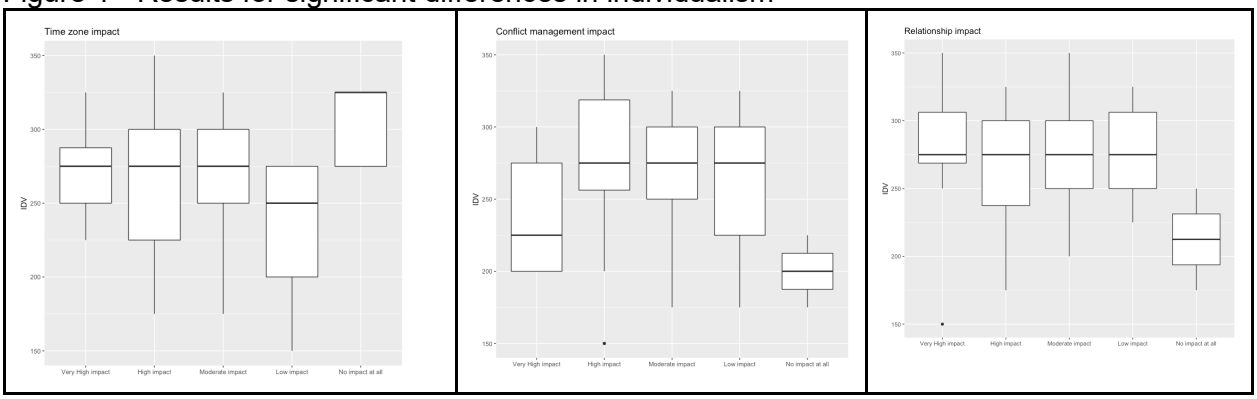
RESULTS

A total of 91 students participated on the survey. Of these, 28 students were from France, 39 were from the United States and 24 were from Brazil. From this total, 43 had no multicultural backgrounds, whereas 48 came from multicultural families or environments. Additionally, 66.7% of the participants alleged to be proud citizens of the countries they lived in.

Statistical analysis of the survey data identified important aspects to be managed when conducting intercultural virtual collaboration activities for sustainability. The first one relates to the

level of individualism in each group of students. Depending on their level of individualism, students tend to disregard important aspects of the virtual exchange activity. Significant differences were found for the impacts of time zone differences (F = 3.128, df = 4, sig = 0.01995), managing conflict from a distance (F= 2.43, df = 4, sig = 0.0553) and the need for building relationships (F= 2.412, df = 4, sig = 0.05682). Figure 1 displays graphical information for the analysis of these differences.

Figure 1 - Results for significant differences in individualism

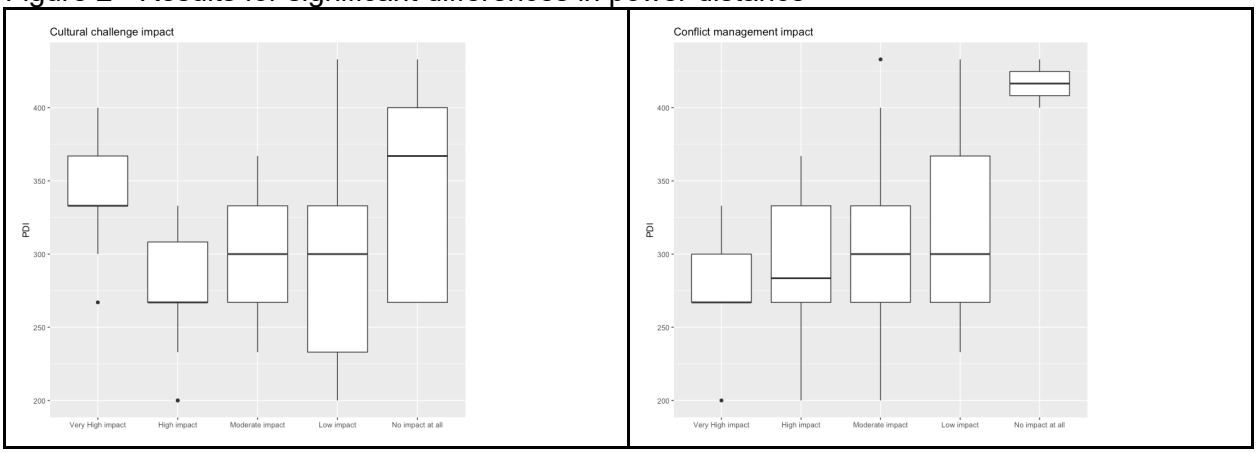


Source: research data

The results from ANOVA showed that students with high level of individualism tend to ignore the complications that arise from time zone differences, by considering it as unimportant and with a low impact over group's performance. On the other hand, people with low levels of individualism will disregard the importance of relationships and managing conflicts from a distance over group's performance.

Different levels of power distance also demonstrated to have significant effects on the perception of group effectiveness in virtual groups' performance. In that case, people with high levels of power distance proved to have increased awareness of the cultural and language challenges impacts on the group assignments (F = 2.738, df = 4, sig = 0.0066). On the other hand, they also tend to ignore the impacts of managing conflict from a distance on a virtual team effectiveness (F = 3.125, df = 4, sig = 0.01987). Figure 2 shows a comparison between different levels of power distance and students' perceptions over those variables.

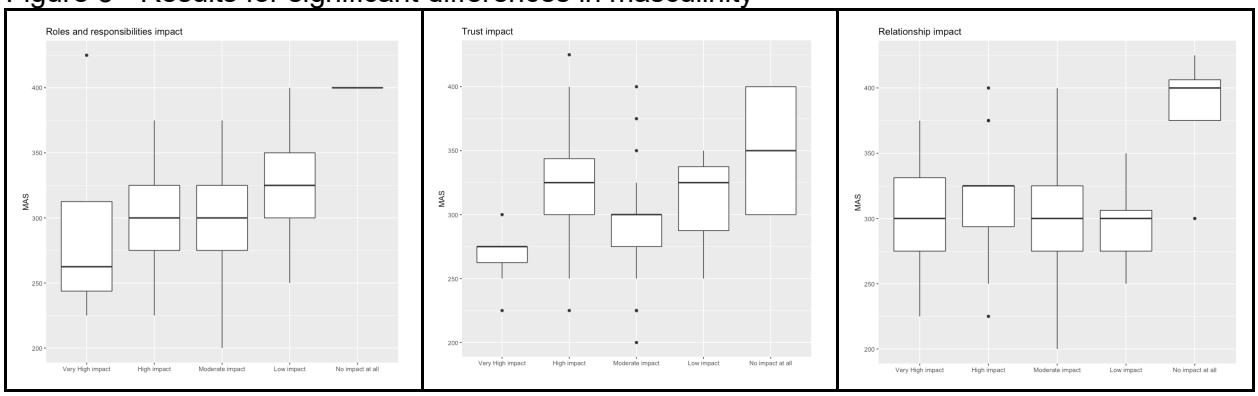
Figure 2 - Results for significant differences in power distance



Source: research data

We also found significant differences for the masculinity dimension on the perception of the impacts of virtual teams work over deciding on roles and responsibilities (F = 3.097, df =4, sig = 0.02069), achieving and maintaining the necessary levels of trust between team members (F = 4.32, df = 4, sig = 0.003483) and building relationships (F = 3.854, df = 4 sig = 0.006804). Figure 3 presents graphic information of these differences.

Figure 3 - Results for significant differences in masculinity



Source: research data

Analyzing such differences show that people with high levels of masculinity tend to perceive lower impacts of relationship building and deciding on roles and responsibilities over task performance. Also, people with lower levels of masculinity tend to recognize higher impact of achieving and maintaining the necessary levels of trust between team members over task performance. Table 1 shows a summary of the main aspects to be considered when conducting virtual exchange involving students from different cultural contexts.

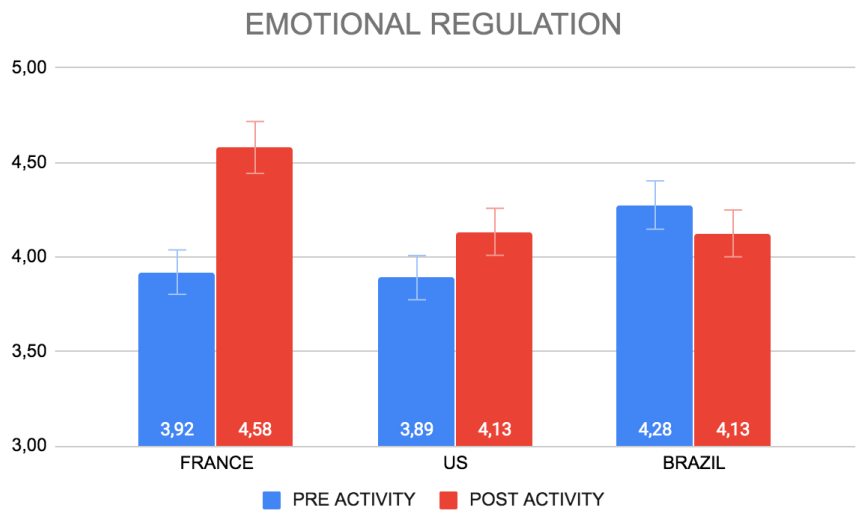
Table 1 - Relationship between group performance and cultural dimensions

Variable	**Individualism**		**Power Distance**		**Masculinity**	
	Impact	Level	Impact	Level	Impact	Level
Managing conflict	LOW	LOW	LOW	HIGH		
Roles and Responsibilities					LOW	HIGH
Trust					LOW	HIGH
Relationship	LOW	LOW			YES	LOW
Cultural challenges			YES	HIGH		
Time zone	LOW	HIGH				

Source: Elaborated by the authors based on research data

We also tested whether cultural competence could be increased via collaborative intercultural virtual exchange, considering each cultural group researched. We found a significant increase in the averages for emotional regulation in the groups formed by French and US students. Figure 4 shows the visual representation for this increase.

Figure 4 - Increase in Emotional Regulation for each research group



Source: research data

On the other hand, although Brazilians showed the lowest level of tolerance, there was a significant increase in their level of tolerance for uncertainty (m_{pre} = 3.36, m_{post} = 3.55). These results also show that the overall evolution of students who participate in virtual exchange experiences is also dependent on their cultural values.

CONCLUSIONS

Virtual exchange programs have been recently used as a way of allowing students to cross national borders without the need to leave their home countries. This way they can experience the challenges of a study abroad or other type of exchange program without the need for long travels, considerable financial expenses, and spending time away from home. Also, these programs are inclusive and allow each and every student in the class to participate. Even though these advantages mimic those from regular exchange, they present challenges that may be very difficult to manage from a distance.

Throughout this article we showed that this type of experience is also an interesting way of working issues related to sustainability in different undergraduate programs. Working with cross-cultural teams from different countries increases student's awareness of the issues related to environmental problems and social stability in a much broader sense. However, these advantages may not be as effective if the virtual exchange program is poorly executed, and therefore, the planning needs to be detailed, transparent, and with clear teaching goals and learning objectives.

After showing how cultural differences may generate different perceptions and expectations over group effectiveness in virtual exchange activities, we sought to provide a practical and analytical tool that may be helpful for teachers and students to better understand the whole process. This way, we discovered that students with high levels of individualism tend to neglect the impact of time zone differences over task effectiveness in their virtual groups, whereas students with low levels of individualism tend to disregard the relationship and conflict management effects over their team's effectiveness. Complementarily, people with high levels of power distance tend to

also neglect the impact of conflict management, but at the same time address a significantly high importance to cultural challenges.

At the end, we show that the development of cultural competence may also be dependent on the culture, as French and US students showed a significant increase in their competence related to emotional regulation, whereas Brazilian students had a significant increase in their level of tolerance for uncertainty.

Although results presented in this article show valuable and important directions for the management of collaborative intercultural virtual exchange programs, we recognize that research in the field is still at its initial stages and further investigation is necessary in order to generate a thorough comprehension of the effects of virtual exchange programs over the development of competencies and sustainability awareness.

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