Developing professional communication skills and competences around sustainability goals

Oksana Polyakova[a], Dorota Chromińska[b] and Ilona Zarajczyk[c]

[a]Universtitat Politècnica de València, okpolnes@upv.es, ID. [b]Warsaw University of Technology, dorota.chrominska@pw.edu ID and [c]Warsaw University of Technology, ilona.zarajczyk@pw.edu.pl ID

Abstract

This study examines the development of professional communication skills and competences within inter-university online teams, focusing specifically on the United Nations 17 Sustainable Development Goals (SDGs) context. As universities increasingly adopt online collaboration stands for curricular projects, it becomes imperative to understand how students can effectively communicate and collaborate towards achieving sustainability objectives. Drawing on the literature related to sustainability and online active learning, this research investigates strategies for enhancing communication proficiency among university students engaged in SDG-related projects. Through a qualitative approach involving participants` perceptions analysis, the study seeks to identify critical challenges and best practices in fostering effective communication within inter-university online teams working on socially meaningful topics. The findings aim to contribute the insights into pedagogical approaches and technological tools that can facilitate knowledge exchange and collective action among students striving to address global challenges. This research underscores the importance of equipping future professionals with the communication skills and competences necessary to navigate complex interdisciplinary contexts and contribute towards their professional capacitation

Keywords: communication skills; transversal competences; sustainability education; Sustainable Development Goals; virtual exchange; engineering education

Resumen

Este estudio examina el desarrollo de destrezas y competencias de comunicación profesional dentro de los equipos interuniversitarios en línea, centrándose específicamente en el contexto de los 17 Objetivos de Desarrollo Sostenible (ODS) de las Naciones Unidas. A medida que las universidades adoptan cada vez más la colaboración en línea, se hace imperativo comprender cómo los estudiantes pueden comunicarse y colaborar de manera efectiva para lograr los objetivos de sostenibilidad. Basándose en la literatura relacionada con la sostenibilidad y el aprendizaje activo en línea, esta investigación descubre estrategias para mejorar el dominio de la comunicación entre los estudiantes universitarios que participan en proyectos relacionados con los ODS. A través de un enfoque cualitativo que incluye el análisis de percepciones de los participantes, el estudio busca identificar desafíos

clave y mejores prácticas para fomentar la comunicación efectiva dentro de equipos interuniversitarios en línea que trabajan en temas socialmente significativos. Los hallazgos tienen como objetivo contribuir a nuevos enfoques pedagógicos y herramientas tecnológicas que pueden facilitar el intercambio de conocimientos mediante la acción colectiva entre los estudiantes que se esfuerzan por abordar los desafíos globales. Esta investigación subraya la importancia de equipar a los futuros profesionales con las competencias y habilidades de comunicación necesaria para navegar contextos interdisciplinares complejos y contribuye a su capacitación profesional

Palabras clave: *habilidades de comunicación; competencias transversales; educación sostenible; Objetivos de Desarrollo Sostenible; intercambio virtual; educación en ingeniería*

1. Introduction

Engineering training is a complex process that connects future technical professionals to the demands of Industry 4.0 and Industry 5.0. In order to meet the needs of our current society for versatile, cross-disciplinary specialists, technical universities should focus on a combination of transversal competences, technical expertise and interpersonal skills (Canós-Darós et al., 2023; Fernández March, 2006; Hernandez-de-Menendez et al., 2020).

Globally, engineering competences count as the ability to solve problems, apply knowledge of science or contemporary problems, communicate effectively, work in teams, or be lifelong learners (Najwa Azmi et al., 2018; Skorczynska Sznajder et al., 2023). These aptitudes are critical for success in engineering and essential for navigating modern technology's constantly evolving landscape. Fostering strategic partnerships and attaining digital transformation in collaborative contexts are often seen as feasible solutions to supporting smart education (Diogo et al., 2023).

The close connection of various competence dimensions of the Technical University of Valencia - *Universitat Politècnica de València* (UPV) framework provides for reliable curricular modelling based on Dimension 1 - Social and environmental commitment, Dimension 2 - Innovation and creativity, Dimension 3 - Teamwork and leadership, Dimension 4 - Effective communication and Dimension 5 - Responsibility and decision-making (Universitat Politècnica de València, 2022).

Therefore, it is crucial to tackle the competence-oriented pathways for effectively implementing Education for Sustainable Development (ESD) as one of the promising approaches is the transformation of learning environments (UNESCO, 2020). As a result, many tertiary institutions are adopting active pedagogies that prioritise sustainable principles (Gusc & van Veen-Dirks, 2017; Polyakova & Galstyan-Sargsyan, 2021). By exploring this avenue in the current study, we work towards creating a more sustainable future and engaging higher education communities in project-based learning projects.

Continuing with this rationale, it is important to clarify the concepts applied to this study:

- sustainability is the cornerstone of the social, economic and cultural balance of the modern global community;

- active learning is a participative framework for inductive, engaging, experimental and collaborative knowledge acquisition;

- virtual exchange is technologically supported and collaborative interaction aimed at promoting international and intercultural aspects of education programmes;

- effective communication is one of the transversal competences for engineers linked to the quality discourse structure, professional writing and speaking abilities, persuasion and capacity to interact in person and online.

To support the integration of this teaching culture, the Institute of Educational Sciences - *Instituto de Ciencias de Educación* (ICE) promotes didactic innovation projects. One such initiative, the Sustainable Education or *SostenibleEdu* proposal, created a special setting for combining educational technologies via online interaction conducted in global languages, which can be viewed as an asset to this type of competence-focused instruction aimed at understanding and applying ESD goals.

The prospects of this innovation, situated at the intersection of Sustainable Development Goals (SDGs) and active learning methodologies, have the potential to empower engineering students by providing them with a hands-on, competence-based training experience through real-time online collaboration (Polyakova & Galstyan-Sargsyan, 2024). This approach embodies the fundamental principles of Agenda 2030, serving the planet, people, prosperity, peace and partnerships (United Nations, 2015).

Indeed, this rather ample outline is an essential part of the upcoming educational research where the following research questions (RQs) are raised:

1. What educational model and study design can promote active learning related to sustainability in online interaction?

2. What methodological practices can be beneficial for developing professional communication skills and competences in global languages?

After the general introduction, the paper is organised as follows. Primarily, we motivate the need for more sustainability-oriented online collaboration linked to small projects and based on a specific methodological approach. We demonstrate the deployment of the experimental setting in synchronous online interactions. As a result, we conclude and offer some recommendations for stakeholders and future practitioners.

2. Methodology

The Sustainable Active Virtual Learning (SAVL) system is an innovative educational model that integrates sustainability principles, active learning methodologies, and virtual technologies to promote effective and environmentally conscious learning experiences (Polyakova & Galstyan-Sargsyan, 2022). Hence, this training system was implemented to promote internal cohesion in the virtual collaboration. This approach has four major elements: (S) sustainability, (A) active learning, (V) virtual exchange and (L) foreign language and competence development. The relationship between the instruction scheme and the study programme has been adapted to the current learning scenario:

(S) by tackling Sustainable Development Goals.

(A) by combining the project-based learning (PBL) approach with socially relevant context.

(V) by scheduling synchronous online meetings for both universities.

(L) by fostering global language learning and competence building.

Consequently, the SALV model establishes a pattern of a forward-thinking approach to education that prioritises sustainability, student engagement, and accessibility in the digital age. Its implementation

consists of specific virtual exchange components, including VE-specific objectives, final tasks, session planning, grading, and feedback, among others.

3. The study context and goals

This study aims to explore new training approaches for active and competence-based learning of significant societal issues in a virtual inter-university environment. By drawing on relevant conceptual and methodological frameworks to address this project, we place the SAVL approach at the heart of the innovation. For this, a group of 15 learners from the Technical University of Valencia (Valencia, Spain) and Warsaw University of Technology (Warsaw, Poland) participated in the training programme called "Developing professional communication skills around the UN 17 Sustainability goals in interuniversity online teams".

In the case of UPV, participants were enrolled in different degree programs at the Industrial Engineering faculty, including Biomedical, Mechanical, Chemical, Industrial Organization, and Energy Engineering degrees. Similarly, WUT participants were Bachelor of Engineering students in various areas, such as Computer Science, Applied Computer Science, Aerospace, Business, and Management Engineering degrees, who were brought together by the professional English course.

In this experimental setting (March-May 2023), the technical undergraduates from both European technical universities were presented with meaningful input related to sustainability goals, project-based methods and digital tools. The final task assigned to the participants was to deliver a presentation on a selected sustainability goal as an international team. The technical students from UPV and WUT needed to provide an overview of the issue, analyse the similarities and differences between Spain and Poland in relation to the problem, and suggest potential solutions or compare existing ones. To manage their project workload, they were utilising EduScrum or agile project methodology adapted to educational contexts. Additionally, the presentations had to be given in English, with a summary in Spanish, and the learners were also expected to both give and respond to the feedback.

To do this, the main objective of the pilot study is to raise awareness of the sustainability issues while interacting in digital inter-university settings and communicating in global languages.

The specific objectives of the program are aligned with the key conceptual domains of the initiative and encompass the following goals:

SO1. Actively engage in group discussions and provide valuable perspectives on sustainability challenges.

SO2. Familiarise oneself with certain aspects of agile methodologies (EduScrum) and project management tools.

SO3. Apply digital transformation principles by applying a digital meetings environment and specific project tools, collaborating with team members in virtual settings, and presenting a final digital assignment.

SO4. Strengthen professional communication skills, emphasising being culturally sensitive to Spanish and Polish societies.

To achieve these objectives, we will create an innovative learning setting where the interaction in English will support the engagement in discussions and presentations on sustainability topics. The approach suggested by Coll Salvador et al. (2023) is planned to be used to measure the project results. This method

connects students, educators, and learning content for supporting constructivist, sociocultural and digital perspectives of new learning environments. In our case, to gather evidence of learning, the researchers and instructors will use a combination of direct and indirect strategies, such as undergraduates` and instructors` feedback, as well as learning content assessment.

4. Study design and development

The overall study design is based on the above-mentioned SAVL methodology with some elements of Collaborative Online International Learning (COIL) - planning, icebreakers, activities and reflection - as Verdejo Gimeno et al. (2023) suggested.

Therefore, the initial planning and organisation stage involved several meetings of Spanish and Polish instructors to discuss the project's objectives, plan, and content. It is worth mentioning that the interaction among educators was the easiest part. Reconciling both universities' syllabi and timetables to co-run the project was the most laborious part of this project.

It is important to note that preparations for the exchange program began a semester in advance. This involved multiple meetings to organize the syllabus, discuss ideas, and bring everything together. While it's difficult to determine the exact time spent on project planning, we can estimate that it was at least double the amount of time normally dedicated to course preparation. Furthermore, extra planning, organisation, and feedback meetings of UPV and WUT educators were necessary to accommodate different academic calendars, technical issues, and assessment and grading systems.

Additionally, certain specific aspects of the joint initiative were profiled: 3 online inter-university Microsoft Teams meetings, Padlet curation of the training materials (see Fig. 1 below), content focus on sustainability, professional communication, and project management.
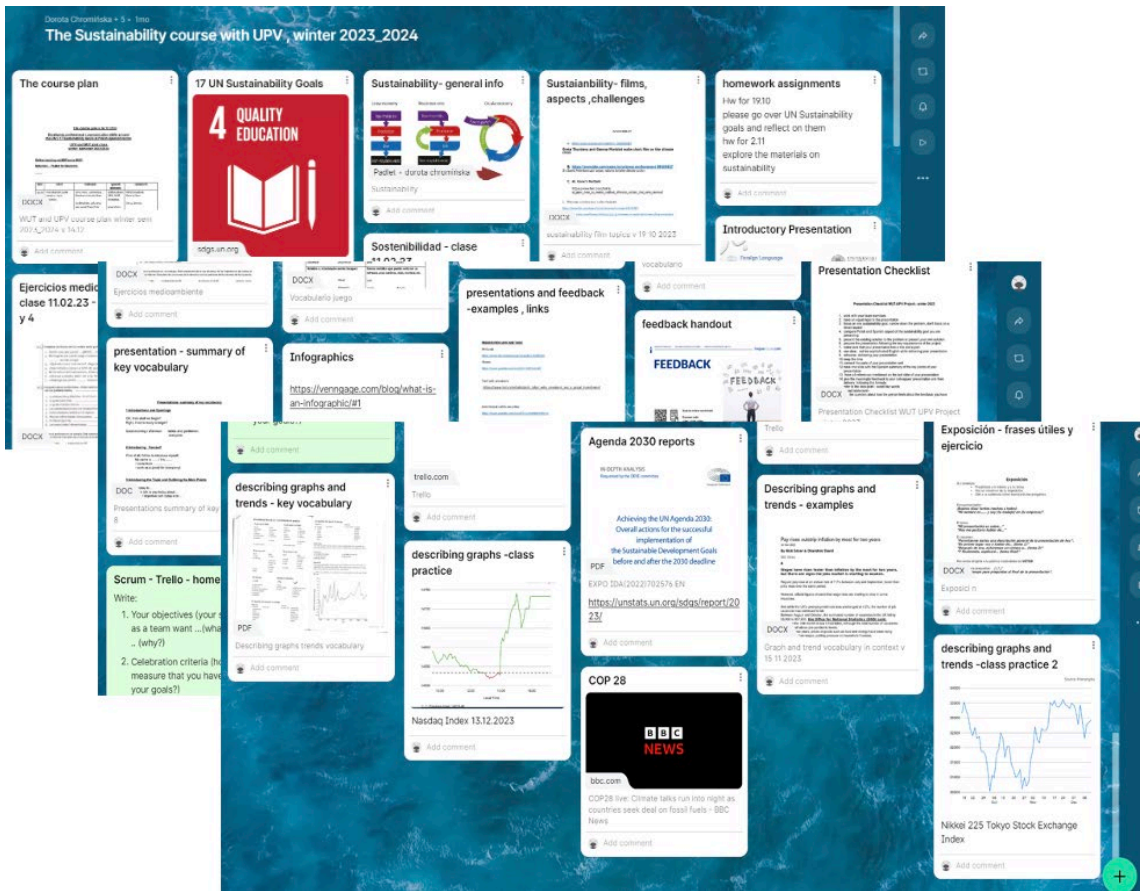
Fig. 1. *The Padlet with the course materials.* Source: own work

Throughout the implementation phase, the undergraduates took the time to familiarise themselves with the concept of sustainability, the 17 UN Development Sustainability Goals, and the EduScrum methodology for project management. In addition, they honed their transversal competences by engaging in effective communication within their teams, through discussing and creating visuals, describing graphs and trends, and delivering presentations. The three online meetings with Spanish and Polish students were designed with a specific scope in mind.

Synchronous meeting 1 was the focal point of the online project. The students engaged in a variety of ice-breaking activities, such as sharing pictures or one-word descriptions that reflect their personality or cultural background. The UPV and WUT were also introduced to showcase the diverse educational backgrounds of their new colleagues. As they formed presentation groups, they compared their knowledge and understanding of sustainability and the 17 UN Development Sustainability Goals. In deciding which goal to focus on, they discussed their respective fields of study. The learners were then presented with the basic assumptions of the EduScrum framework, which taught them how to set goals, measure progress, and analyse their work in order to achieve success. Figure 2 shows the Ukrainian guests from Dnipro University of Technology (Dnipro, Ukraine) who joined the introductory meeting to share their experience of studying at the time of conflict.
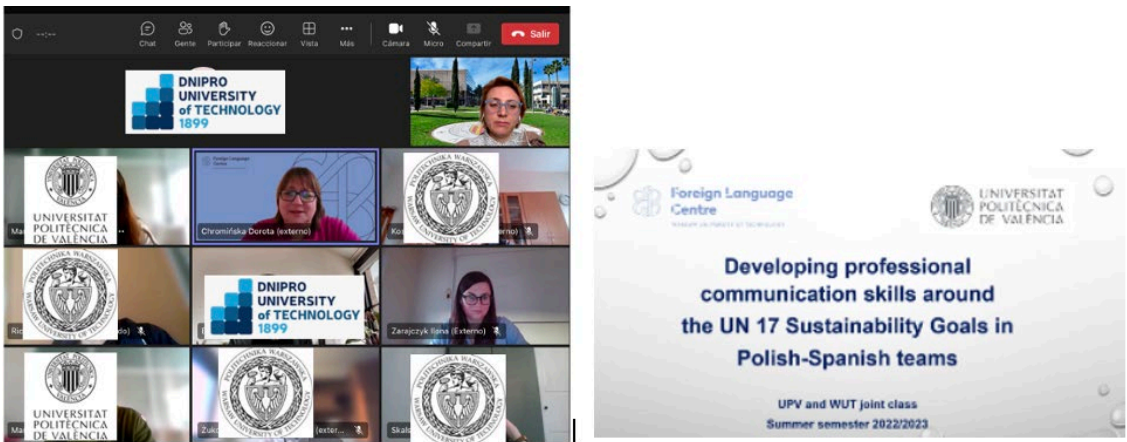
Fig. 2. *Introductory meeting print screen.* Source: own work

Synchronous meeting 2 was linked to the groups project work and mentoring. Thus, the teams were exchanging their EduScrum reports, showcasing their project advancements and identifying areas that required attention. Every group was diligently sorting their research outcomes and dedicating themselves to the project. Additionally, they were intently examining the Spanish and Polish perspectives on the sustainability challenge, analysing existing solutions and exploring potential implementations.

For example, one of the teams chose the Sustainable cities goal and related it to the project-based learning in this way (see Fig. 3 below):

(a) Miro board for ideas on project learning helped create the team's own learning setting and specific goals.

(b) Trello board for tracking group work progress supported the process of collaborative interaction on professional level.
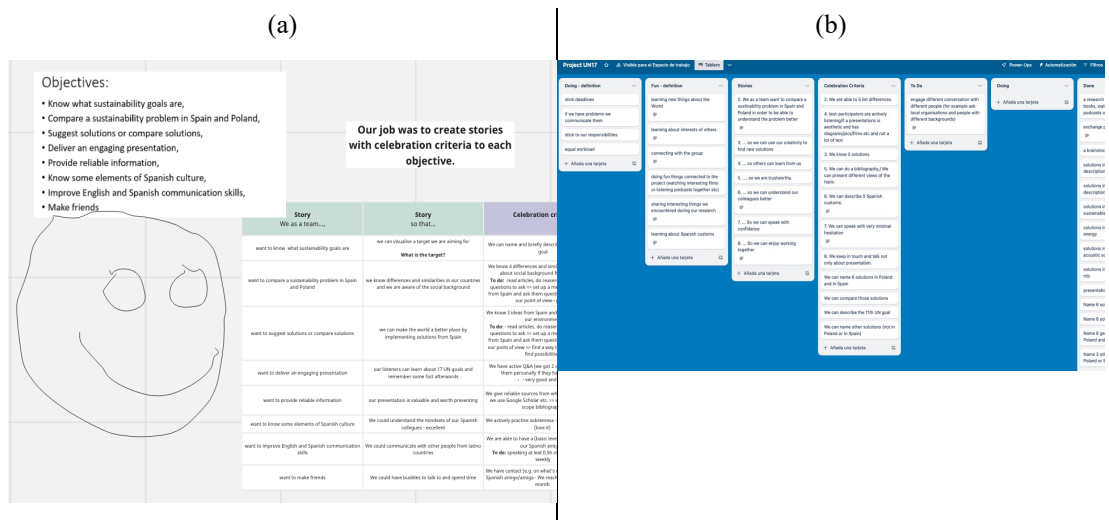
(a)   (b)

Fig. 3. *Miro and Trello-based group work.* Source: own elaboration based on project work example

Synchronous meeting 3 was the special moment of final task presentations, questions and answers session and project-based learning. Each group engaged in presenting their respective SDG ideas, after which the

remaining groups, along with the instructors, offered their comments. The specific approach adopted from the TED talk titled "The Secret to Giving Great Feedback" (Renninger, 2020) suggested a way of offering constructive feedback. During the virtual presentations, the participants utilised specific ways for expressing their opinions: providing a data point to reference a specific aspect of the presentation, sharing an impact statement to convey how the point affected them, and asking the presenters for their thoughts on the given feedback.

Fig. 4. *Presentation "Sustainable cities".* Source: own elaboration based on project work example

5. Results

As we have already seen, the goals of this pilot initiative are manifold, even though the overall outcomes analysis seeks to align them with the study objectives closely. On the basis of the results` assessment suggested in section three, we first examine the learning content of the training and then proceed to the learners` and instructor`s feedback.

5.1. Training outline

The sequence of sessions and actions rooted in the SAVL method was the initial motivation for creating a relevant collaborative experience. Figure 5 below summarises the correlation of the building blocks of the learning materials by delving into the next segments:

(A) all three sessions include international participation of technical universities and connect them to the specific sustainable, active, virtual learning scenario.

(B) the core idea developed through three sessions is a practical application of sustainability concepts and goals to the cross-cultural environment.

(C) in the dynamic and interactive collaboration, many input and output learning materials and digital tools were used (presentations, videos, Padlet, Miro, Trello, etc).
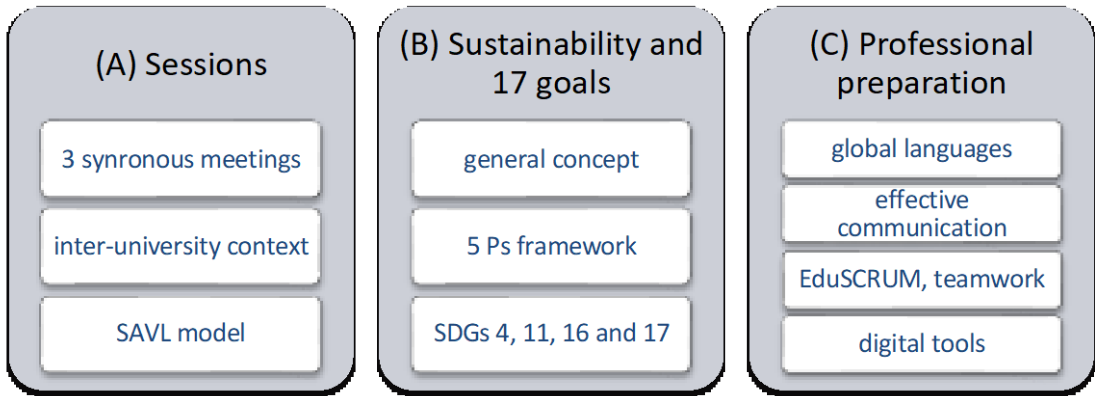

Fig. 5. *Learning content overview.* Source: own elaboration

The above-detailed materials enrich the training and development of professional communication skills and competences around sustainability goals. This means that integrating virtual exchanges into the curricular structure makes the educator work harder due to building new learning pathways. Equally, raising social, economic and cultural awareness by stimulating action-based information management for future technical experts is rewarding.

5.2. Learners` feedback

In order to gain deeper insight into the feedback provided by the students, the researchers analysed five brief video comments shared by a group consisting of three female and two male participants. Employing a combined methodology that incorporates elements from both computer science and linguistics, known as sentiment analysis, the researchers have identified learners' opinions and emotions via Lingmotif tool (Moreno Ortiz, 2017; Taboada, 2016).

Fig. 6. *Learners` feedback: sentiment analysis.* Source: own elaboration

Specifically, Figure 6 illustrates an extremely positive and intense perception of the exchange outcomes (1) represented by 1442 words. While compiling only optimistic word cloud (2), the tool highlights the repetition of the items "sustainability" and "like" 7 times each, "interesting" 5 times and "really enjoyed" and "enjoy" 5 times each. These data determine the overall enthusiastic mindset of the partakers regarding the exchange project.

Congreso In-Red (2024)

5.3. Instructors` feedback

In the case of educators` opinions, we asked for their conclusions related to the pilot project using the Microsoft Forms questionnaire and Word cloud option. Here are the answers 3 female teachers from UPV and WUT gave:

1) If you were to participate again in the course/initiative, what would you repeat?

Overall, the consensus regarding the experimental course is that it is crucial to proceed with future iterations of the virtual exchange program. Doing so would provide invaluable learning opportunities for both students and instructors and foster cultural understanding. With regards to the specifics of the course, the various teaching strategies, discussion topics, and reflection exercises proved to be highly effective for educators.

2) What would you do differently?

Within this domain, progress is closely tied to the concepts of "time," "work," and "students." The instructors have addressed the core challenge of allocating sufficient time to complete project activities. Furthermore, students require adequate time and space to effectively engage in project planning, with particular attention paid to the investment of time dedicated to collaborative interactions in foreign languages.

3) What interesting ideas do you take from this course?

The trainers emphasised that "international experience" is highly valuable for both students and instructors alike, as it fosters the development of professional connections and facilitates academic growth. Additionally, the shared collaborative approach of the three pedagogic perspectives was a truly inspiring outcome.

6. Conclusions

Developing professional communication skills within the context of sustainability is an imperative aspect of contemporary education, particularly within the realms of technical and engineering disciplines. This research endeavours to scrutinise the cultivation of these competences amongst inter-university online teams, with a special focus on the United Nations' 17 Sustainable Development Goals (SDGs). The adoption of online collaboration platforms by universities for interdisciplinary projects necessitates a profound understanding of the mechanisms through which students can efficaciously communicate and collaborate to fulfil sustainability objectives.

Drawing upon an extensive review of the literature encompassing sustainability, transversal competences, and the dynamics of online project work in teams, this study explores methodologies to augment communication proficiency among university students partaking in SDG-related missions. Employing a qualitative research methodology encompassing participants' perceptions and observations, this investigation seeks to address the research questions set at the beginning of the training:

RQ1. What educational model and study design can promote active learning related to sustainability in online interaction? The Agenda 2030's call for Education for Sustainability pathways necessitates fresh approaches to comprehending development pillars and goals. As per the findings of a pilot study, an effective solution to address this challenge in curricular planning involves virtual collaborations in inter-university settings. By blending active learning techniques with pertinent content, students and instructors can optimise their cross-cultural experience, especially when dealing with global languages.

RQ2. What methodological practices can be beneficial for developing professional communication skills and competences in global languages? The foundation of our educational programme involves a collaborative approach to enhance effective communication skills in digital media. However, it's important to remember that other important aspects will come to light as we develop these cross-functional competences. These include social and environmental commitment, innovation and creativity, teamwork and leadership, and responsibility and decision-making. All of these transversal capacities have been seamlessly integrated into our SAVL model of virtual exchanges, resulting in a successful and comprehensive approach to technical learning.

The findings of this research are intended to provide valuable insights into pedagogical strategies and technological tools that can facilitate constructive dialogue, knowledge dissemination, and collective action among students endeavouring to tackle global sustainability challenges. This study emphasizes the criticality of arming future professionals with the requisite communication skills to effectively navigate complex interdisciplinary contexts and contribute significantly towards attaining the SDGs.

Based on the pilot format of the study, we have gathered some recommendations. Firstly, the organisers should ensure a synchronous schedule that works for everyone involved. Proper incentives such as grades or additional credits could be offered to encourage involvement. Secondly, high-quality training materials, designed using active methodologies and challenging tasks, are essential to maintain participants' commitment. Lastly, the successful implementation of this initiative requires educators and students to work collaboratively with open minds and a dedicated approach. The enthusiastic attitude initiated by the organizers proved vital in overcoming minor challenges and building capacities.

Given the pilot format of the current study and the small sample size, these findings offer preliminary evidence in support of the underlying concept, which warrants further exploration on a larger scale. Building upon this foundation, our research highlights the significant role that cross-cultural online interactions play in promoting effective communication, language proficiency, and sustainability among international engineering students. It is evident that technical settings alone are not enough to foster thought-provoking learning experiences in a global context.

Acknowledgements

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