# The quest for sustainable teaching praxis:
## Opportunities and challenges of multidisciplinary and multicultural teamwork

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**Abstract:** This article explores the dynamics arising by multidisciplinary and multicultural student teams (MMT), working through Case-based Learning (CBL) and Problem-based Learning (PBL); as well as its use as a sustainable teaching practice. Based on a mixed methods approach, which includes observation (both physical and virtual) and questionnaires, the study reveals that MMT through CBL and PBL can both facilitate and hinder sustainable learning. Our findings show that while MMT enhances knowledge sharing, it also poses a wide range of challenges, raising questions about its social significance as a sustainable teaching practice. The study suggests the implementation of certain mechanisms, such as 'Teamwork Training' and 'Pedagogical Mentors', aiming to strengthen the sustainable orientation of MMT through CBL and PBL.

**Keywords:** sustainable teaching; multidisciplinary; multicultural; teams; case-based learning; problem-based learning; teamwork

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## Introduction

*Twenty –eight students are present. Others enter hastily with mugs of steaming coffee in their hands. There is an air of anxiety as they are going to hold their first group meeting in preparation for their student-led presentations. In anticipation, some of them arrive early, others arrive late, whereas, others fail to show up. Some seem to be disappointed as peers arrived unprepared. At one point, a student can be heard saying that he failed to log into the Google application from home and missed most of the discussion... A number of students avoid discussing topics that are considered taboo at home, which negatively affects group-work. In one of the groups, there is some sort of disagreement about the presentation. At the end of the lesson, a group complains about one of its members… it raises concerns about the selection and formation of the group. Two students from other groups ask to do their presentations individually.*

<div align="right">

*Observation journal, 4 March, 'Management of Innovation & Technology'*

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The vignette presented above is not unknown to the everyday life of academic community, especially in diversified classrooms with multicultural and multidisciplinary cohorts. Differing students' perspectives, attitudes and learning styles are common in international cohorts [1]. The undergraduate module of 'Management of Innovation and Technology', which is the central in the current study, is an international cohort with similar characteristics. It is an interdisciplinary course, offered as an elective to 3rd and 4th year Business School and Computer Science; and as required/ elective for Erasmus students from various disciplines and cultures. As presented in Table 4 (in the 'Findings' section), the cohort is comprised by students from at least 13 different countries. The aim of the course is to explore the world of technology and strategy for managers and entrepreneurs. It equips students with the necessary tools, strategies, techniques and viewpoints to be effective in thinking and formulating technology strategy. Among a range of learning activities (e.g. faculty and guest lectures; seminars; and guided reading of case studies), the course includes in-class teamwork exercises, student interaction through Google Duo and Google Hangout, as well as student-led presentations on real-problem situations.

However, as indicated in the opening vignette, teamwork activities in a contemporary education context do not come without their challenges. Education as a whole can be said to be part of an

ongoing transition, which is comprised by opportunities and challenges. Student mobility, technological advancements (e.g. learning platforms) and social change (e.g. diversified environments), continuously pose challenges on pedagogy, policy and teaching practices. Owing to the ever changing education landscape, there is a growing interest for sustainable contemporary academic practices [2].

In this article, we distinguish 'sustainable teaching practices', based on three different characteristics: a) international orientation, b) accessibility and c) 21$^{st}$ century skills & competencies. The first characteristic entails that there is an emphasis on methods and learning that are linked to the world's changing expectations [3]. Sustainable teaching methods and practices are those that consider, adapt and meet the diverse needs of international student cohorts. The second characteristic entails that sustainable practices facilitate educational inclusion through utilization of technology for accessibility, functionality and cost efficiency – while taking into consideration local pragmatic realities and student difficulties. The third characteristic warrants that sustainable practices aim at cultivating 21$^{st}$ century competencies. These competencies concern twelve skills that today's students need to acquire in order to keep up with the fast-pace changes in contemporary industry [4]. Overall, sustainable education exists in a wider context, where multiculturalism, diversity and inclusion are central to the discussion agendas in Higher Education [5] – hence the emphasis on multicultural teamwork in the current study.

In this article, we seek to add to the growing body of sustainable education by testing empirically five dimensions of teamwork, which are, a) Multidisciplinary and b) Multicultural Teams (MMT) working through c) Case-based Learning (CBL) and d) Problem-based Learning (PBL), e) both face-to-face and online. In our opinion, MMT, CBL and PBL are likely to be part of sustainable education inasmuch as they improve students' awareness, critical thinking, problem-solving and skills to deal with real world challenges. In theory, CBL and PBL, as learning strategies, promote active participation; lead to innovative solutions to problems; provide students with relevant opportunities to bridge theory with practice through exposure to real-world situations; and engage students in a collaborative environment [6]. However, how useful is case-based and problem-based activities in multi-cultural and multi-discipline collaboration? How does the addition of technology (e.g. Google applications) in the teamwork process influence the learning experience;

is it beneficial and meaningful? How many of the teamwork practices are really sustainable in a diversified and multidisciplinary context? How do diversified team formations respond to problem-based learning?

By bringing the five dimensions together, the article makes an original contribution to the literature of sustainable education. Using mixed methods, which include observations and questionnaires, the article explores the impact of these learning activities on critical and reflective practice. The article also adds to the existing literature in the field of inter-cultural learning, and a wider effort to explore methods, practices and developing technologies that meet the diverse needs of international student cohorts.

In the next section, the conceptual framework of Sustainable Education is reviewed, together with studies in the field of teamwork, case-based and problem-based activities. After that, the article presents the methodological underpinnings of the study, prior to discussing the results of fieldwork. The article concludes with recommendations on the meaningful application of teaching practices, and how pragmatic realities in diverse student groups determine effective teaching.

## Literature Review – Sustainable Teaching Practices

What is meant by sustainable education? What are the so called sustainable teaching practices? Being accredited and validated by local authorities, isn't all teaching supposed to be sustainable? Inasmuch as its primary purpose is to prepare students for employment and long-term career, isn't formal education sustainable?  The answer to these questions, along with the contribution of this article, predominantly concerns an emphasis on teaching practices that adapts to the changing environment, as well as the student competencies, changing learning styles and new technologies that come with it. Also, sustainable teaching methods and practices are those that consider and meet the diverse needs of international student cohorts. Moreover, in a wider context, sustainable practices facilitate educational inclusion through utilization of technology for accessibility and cost efficiency.

In literature, several accounts contribute to our understanding of sustainable education and sustainable teaching practices. One approach concerns the so called 'sustainable feedback', that is, feedback sought and asked for by students instead of having teachers give the feedback without prior solicitation [7, 8]. The main principle here is that students are equipped to become self-initiating seekers and users of information, which is vital for lifetime learning [9]. Similarly, for Geitz et al (2016), feedback is sustainable inasmuch as it places students in an active role in which they generate and use feedback from peers, self or others [10]. Students have to judge their own work according to learning objectives, ask for feedback and compare their own internal judgments thereof with the external judgments of others. Based on this, students can plan further steps, towards achieving learning objectives in subsequent tasks [8]. While not everything characterized as feedback is effective, within this framework, sustainability stems from continuous dialogue between students and tutors of what feedback is, and developing the necessary skills for it [10].

Another approach in sustainable education is linked to sustainable development, that is, education helping students acquire knowledge, learning capacity, lifestyle, and values for sustainable development in society, economy, environment and culture [5]. In this context, sustainable education needs to divert away from traditional, teacher-centric education. It rather needs to link knowledge with actual world problems [11] through an inter-disciplinary and cross-disciplinary approach to developing the competences needed for building a sustainable future [12, 5]. Sustainable teaching practices and sustainable development are both seen as means of fostering the ideals of internationalization [2].

Sustainable education and sustainable development are also linked to the so called 'Sustainable Curricular'. Higher education institutions (HEI) perform periodical curricular reviews adhering to internal and external quality assurance systems. However, along with quality assurance and validation, Varouchas et al (2018) suggest the application of quality metrics to maintain academic program sustainability [3]. More specifically, quality measurements, stemming from certain Key Performance indicators (KPIs), provide the basis for rethinking curriculum and pedagogical strategies for developing sustainable higher education programs.

Moreover, other scholars link sustainability to assessments.  For instance, Traverso-Ribón et al (2013), explain how self-assessment, peer assessment and co-assessment, as part of formative tasks, serve as means of sustainable evaluation [13]. For [14], sustainable assessment is enhanced through collaborative evaluation strategies, such as self-evaluation and co-evaluation among team members while performing tasks. To the extent that it includes peer and/ or team collaboration, certain assessments can be seen as sustainable. Also, according to [9], sustainable assessments differ from the usual formative tasks as they help students develop life-long learning evaluation skills.

Another approach to sustainable education explores existing teaching practices through technological advancements. This framework is also known as technology-enhanced learning (TEL), which questions how the processes of teaching and learning can benefit from the use of technology [15]. For instance, [16] examine laboratory work through Virtual Reality (VR) as a sustainable teaching tool with multiple benefits. A VR laboratory is easy to be updated, without the need of continuously purchasing new equipment, whereby, it is capable of simulating extreme situations without the risk of injury. Furthermore, the authors use the example of VR robotic arms. The robotic simulator is a sustainable teaching method inasmuch as all students get the opportunity to manage their own version of the robotic cell, without queuing delays and extra costs (which is usually the case with a real robotic arm in a laboratory), and while being safe of damaging the cell components. Within the framework of TLE, moreover, we can also locate the so called smart sustainable education, that is, learning supported by a variety of tech-enabled smart devices, such as smartphones and tablets [17].

Sustainable education is also located by scholars at the crossroads of technology and teamwork. Learning platforms (also known as Virtual Learning Environments, VLE), Learning Analytics (LA), Open-Source Software (OS) and computational tools (such as Google-Duo, Hangout and previously the Google Plus), forge sustainable teamwork evaluation – subject to certain infrastructure interconnections [13]. However, teamwork, as a learning activity, can take many forms. In this article, our emphasis is on the multi-disciplinary and multi-cultural nature of teamwork, where members engage with real-case tasks; and with the support of technology (Google Applications). Multi-disciplinary and multicultural teamwork is defined as a group of

members with diverse professional backgrounds, nationalities and cultures, working collectively towards the achievement of common goals [18, 19].

It is widely documented in the literature that multidisciplinary and multicultural group collaboration help students gain deeper knowledge, share experiences and achieve common tasks [20, 21, 22, 23, 24] Students are likely to produce innovative ideas, which stem from various viewpoints, experiences and cultures [25, 26]. They are also likely to deal with real-world complex situations that require knowledge of various disciplines. Multidisciplinary group collaboration helps student develop deeper knowledge, improve communication, comprehend collaboration processes, share their diverse experiences and reach a consensus agreement on professional solutions, which results to sustainable education [4].  This process could be sustainable education inasmuch as it improves students' awareness, critical thinking, and skills to deal with the issue in the real world. However, multidisciplinary and multicultural collaboration is not without its challenges.  Time pressures and difficulties arising from people with different backgrounds are common [26]. Also, while diversity can increase creativity and innovation [27, 28], it often leads to conflict. This kind of weaknesses are subject to study in this particular article.

Moreover, along with multidisciplinary and multicultural teamwork, the current article introduces another two dimensions, which can be linked to sustainable teaching. The so called Case-based Learning (CBL) and Problem-based Learning (PBL) are among the most common student-centered methods that provide examples of real-life/ corporate cases. They are based on the same principles – teach content with real world or authentic situations and expose students to multiple sources of viewpoints. In theory, both learning pedagogies can: ensure active participation; lead to innovative solutions to problems; provide students with relevant opportunities to bridge theory with practice through exposure to real-world situations; and engage students in a collaborative environment [6]. The question is, how sustainable is the implementation and outcome of these practices in a multicultural and multidiscipline cohort? To our knowledge, the current article is the first study exploring MMT through CBL and PBL in the sustainable education framework.

The quest of sustainable teaching practices is a living process (10, 2]. Practices are tested, scrutinized and informed further for application; in different contexts, diversified backgrounds and

in the light of continuous technological change. In pursuit of sustainable teaching, no practice is standalone or complete. Therefore, we revisit teamwork and explore the sustainability of MMT through CBL and PBL, in the light of wider technological advancements [e.g. 29, 30, 31, 32, 33, 34, 35].

## Research Design and Methods

### *The Context*

Multidisciplinary and Multicultural Teamwork through Case-based Learning and Problem-based Learning was applied in the 'Management of Innovation and Technology' Course. The aim was to challenge multidisciplinary-multicultural student groups to work together on common projects and expose them to technology innovation management practices [23]. During the second week of classes, the lecturer formed student groups. Each group consisted of 4-5 students coming from different majors of study and different countries. The lecturer played the role of the facilitator and resource provider throughout students' problem-based and case-based teamwork. Students' active participation and contributions in group discussions were of major importance for the overall grading assessment, measured by a rubric on students' arguments, answers, presentations, and participation in teamwork discussions.

The groups had to solve either real-life cases or problems. The lecturer used cases from the Harvard School of Business Publishing Case Center [36]. As presented in Table 1, most of the cases used were in the field of technology, innovation, patents, copyrights, intellectual property rights and corporate strategy - reflecting the module's content.

| Table 1: Sample list of the case-studies used for MMT through CBL and PBL | |
|---|---|
| 1 | 'Goldieblox: Toy Company and Copyright Infringement'. Case referring to GoldieBlox being accused of copyright violation. |
| 2 | 'Fight for a Patent Vs Keeping your Invention a Trade Secret'. Case referring to Wyeth pharmaceutical that relies on patent and trade secret protection for its innovation. |

| 3 | 'The CEO of Novartis on Growing After a Patent Cliff'. Case describing the challenges with Diovan, a patented drug accounting for 20% of the pharmaceutical division's revenue. |
|---|---|
| 4 | 'The growth of Electric Vehicles Industry: Facilitating and Imputing Forces'. Case analyzing the forces driving the 21$^{st}$ century automotive industry toward electrification. |
| Source: Harvard Business Review, [36] | |

The problems given to students varied according to each lesson's weekly learning objectives. For instance, an in-class problem asked groups was to imagine a situation in which their organization needs to: (a) come up with an innovation that will lead the organization to growth; (b) how to evaluate the innovations and decide which one will be more attractive to customers; (c) which strategies to implement in order to capture value from innovation; and (d) how to achieve competitive advantage. Much of the teamwork and preparation had to take place online through Google applications, such as Google Duo and Google Video Talk.

## Methods

In order to investigate the effectiveness of MMT through CBL and PBL, in terms of sustainability, a mixed method approach was used, combining qualitative and quantitative methods. The methods of Direct Observation and Online Questionnaire were used, as discussed below.

### A. Physical and Virtual Observation

The first method employed by the study is the so called 'direct observation', also called "observational study" [37]. Direct observation is often used for qualitative research about human phenomena [38], cultures, events and other situations [37]. This method, initially used by anthropologists, is now widely used in various other disciplines such as sociology, psychology, education [39], marketing [40], and linguistics, among others. It can be used alone or in combination with other methods. In the current study, the process included the lecturer observing the students closely and discreetly during group-work, both in a physical classroom and Google applications, such as the Google Duo and Hangout tools.

The decision to conduct direct observations, concern researcher's ability to observe students in their natural environment and collect findings while students interact during teamwork. Other than student behavior, the process facilitated collection of findings regarding the effectiveness of MMT through CBL and PBL in-class activities. The lecturer also maintained a digital journal on students' interaction and engagement on Google Duo and Google Hangout. The data collected are both qualitative and quantitative. Qualitative data concern work submitted by team members for certain tasks on Google sites, including peer feedback among team members. Quantitative data concern student attendance and engagement with teamwork Google sites.  To analyse the findings, a qualitative (content) analysis was employed. The observation process lasted for 12 weeks during the Fall of 2019.

### B. Online Questionnaire

In addition to the observation sessions, it was deemed necessary to obtain data reflecting students' perceptions and views of the MMT experience.  A questionnaire was designed in Google Forms and was distributed online after the completion of the course. It was distributed in late January, 2020, and participants had 15 days to respond. At this point, it is worth mentioning that the accounts of all previous class members remain active on the cloud as part of a vibrant online community. Students and graduates can communicate, discuss and exchange ideas - amongst them and with the lecturer - for the rest of their life. Friendships and professional collaborations are formed by students at international level, whereas, the lecturer often adopts a mentoring role. This practice, which is a form of sustainable education, made the recruitment of questionnaire participants easier. Fifty-nine (59) individuals answered the questionnaire in total.

Furthermore, the results were calculated by the same software that generated the forms. The questionnaire was clear, concise and easy to answer. It consisted of four questions on demographics to obtain information about the participants' age group, gender, country of origin and major of study. Twelve statements followed asking students their opinion about: teamwork in the course in general; their work on case studies and problems; multidisciplinary knowledge transfer and sharing; and multicultural knowledge transfer and sharing. The respondents were asked to rate their MMT experience through CBL and PBL activities, choosing only one answer

on a scale of four choices (Strongly Agree, Agree, Disagree and Strongly Disagree). The actual statements appear in Table 1 below.

| 1. | I enjoyed working in teams. |
|---|---|
| 2. | I found teamwork a valuable experience for this course. |
| 3. | Everyone in my group had equal opportunities to participate in the discussions. |
| 4. | Everyone in my group did an equal amount of work. |
| 5. | Everyone was present in group work activities. |
| 6. | I felt confident to discuss my ideas with the team members. |
| 7. | My ideas seemed to count in teamwork. |
| 8. | Some of my group members' ideas were valuable. |
| 9. | I gained knowledge by working with case studies in teams. |
| 10. | I gained knowledge by working with problems in teams. |
| 11. | I believe that working with students from other majors of study helped me gain additional knowledge on a subject. |
| 12. | I believe that working with students from other cultures helped me gain additional knowledge on a subject. |
| Table 2: Survey statements on MMT CBL and PBL | |

To ensure that the wording was clear and appropriate, the questionnaire was first administered to ten volunteers on a pilot basis and adjustments were made following feedback.

# Findings

### A.  *Observation*

Content analysis of observation-notes reveals challenges as well as benefits of MMT through CBL and PBL activities. Some notable challenges concern learning styles, commitment, punctuality and language barriers, among others. The benefits, on the other hand, concern knowledge transfer and problem solving, as discussed in the following section.

*Sustainability through Knowledge Transfer and Sharing*

Findings reveal that, in all MMT through CBL and PBL activities, the major benefit was knowledge transfer from one student to another. There was knowledge sharing emerging from their disciplines and, knowledge stemming from their cultural backgrounds. Thus, two types of Knowledge Transfer are identified in this type of teamwork: (a) Multidisciplinary Knowledge Transfer and Sharing; and (b) Multicultural Knowledge Transfer and Sharing. When it comes to Multidisciplinary Knowledge Transfer and Sharing, the following observation note is indicative:

*"Two cases were assigned to student teams to read and analyze regarding the intellectual property rights of pharmaceutical industries: (a) The Wyeth's Case patent and trade secret protection for its innovation, where different forms of intellectual property rights are used to protect valuable information; (b) The CEO of Novartis Case with the company facing a big challenge with Diovan about losing its patent. It was interesting to see that three ERASMUS students, with major of study in Healthcare Management, shared valuable experiences regarding pharmaceutical procedures for medication. They were also able to explain the companies' continuous struggle for competitive advantage and/ or being the First Mover. They also explained thoroughly the process of patent experimentation and different legal frameworks. Other team members were taking notes".*

The following note is also representative of MMT effectiveness through CBL and PBL:

*"Students were given a case on Goldieblox toy company and Copyright infringement. A Lithuanian student, studying Computer Science, shared her personal professional experience in writing the code for a software that she plans to sell. While discussing the case of Goldieblox toy company, she explained the importance of copyrights on music and software production and how she plans to copyright her new software to deter imitation. Students seemed to enjoy the student's narrative and linked their teammate's experience with the case"*

As seen from the above two examples, students have provided their team members with information drawn from their disciplines. Much of this knowledge concerns prior professional

experiences. During the process, team members of other disciplines have become aware of issues unknown to them and have gained interdisciplinary knowledge. This is in agreement with Jackson et. al. that through multidisciplinary collaboration team members can reinforce each other and work collectively toward the achievement of common goals [18]. Although there are currently no studies discussing multidisciplinary teamwork as a sustainable teaching practice, the process we observed, along with the discussion of students' real-life experiences, seem to align with the principles of sustainable education – especially in terms of its international orientation and 21st century skills.

In addition to the significance of multidisciplinary teamwork, the following observation-note reveals the significance of multicultural group work on case-based and problem-based learning activities.

*"The case of 'Electric Cars' provided students with a historic overview of the electric vehicle industry prior to discussing the forces driving the 21$^{st}$ century automotive industry toward electrification. Students from Cyprus, Libya, and Egypt stated that they would not buy an electric car since their countries do not support the infrastructure for such Technology innovation whereas the government does not offer any incentives to motivate a purchase. Students from Germany said that grants for plug-in hybrids are 4,500 euros. For vehicles priced over 40,000 euros the grants will rise to 5,000 euros. They said that the German government wants to have 10 million electric vehicles on the roads by 2030. A Dutch student living in Finland, mentioned that as from 2030, only emissions free vehicles will be allowed to be newly registered. This initiative is linked to incentives, such as a) funded subsidization for the purchase of electric cars valued at 6,000 euros, beginning in 2021; and b) VAT free electric vehicles and motor vehicle taxes starting in 2025."*

Another note illuminating the effectiveness of MMT is the following: *"Students were given real life cases on how Pharmaceutical Industries protected their inventions. It was obvious that students from Germany, the Netherlands, Lithuania, and China were familiar with such issues; while students from Bulgaria and Cyprus stated that they had no idea how important it was for such industries to protect their innovations and capture the value from their products."*

These examples show that students have transferred and shared their own national and cultural experiences with others, thus, informing their team members about values and policies exist at the international level. Internationalization in education is according to Giddens (1999) a positive response to globalization, which stimulates nations to interact and enrich each other with fresh cultural insights and exchanges [41].

The following notes concern problem-based learning activities, which reveal knowledge transfer in a way similar to case-based learning:

Problem A: *"All nine groups have been assigned to come up with a Technology innovation. After 1 1/2 hour of discussion on various aspects of the innovations, students decided to keep three out of nine and finally ended up with one, The Invisible Solar Panels-ISP. This idea has been proposed by a Cypriot student in his final year of Management studies. He managed to convince his classmates that technological development of photovoltaic systems moves in a fast pace. He explained that although Cyprus is blessed with sunshine and is an excellent place to utilize solar energy, it has limited production of solar energy. Two students (from Egypt and Cyprus) agreed."*

Problem B: "*The students were asked to find ways to capture value from innovations, achieve competitive advantage, establish a brand value and do proper promotion. One student with Marketing background explained to her teammates how a marketeer thinks and which strategies to follow in order to reach the majority of early and late adopters of photovoltaic systems. Students argued that they were completely unfamiliar with some of the strategies so she offered them guidance. A long discussion followed, linking some of the practices to actual corporate examples. The discussion continued lively on Google Hangouts for several days.*

The above observations are a few among several PBL examples, where Multidisciplinary Knowledge Transfer and Sharing; and Multicultural Knowledge Transfer and Sharing, are proved helpful during MMT. In addition, no student complaints were recorded regarding the use of Google applications. As mentioned earlier (in the Methods' section), the accounts of all previous cohorts

for this module remain active on the cloud as part of a vibrant online community. Students and graduates can communicate, discuss and exchange ideas - amongst them and with the lecturer - for the rest of their life. Students seem to find the interaction via online applications helpful.

Overall, findings confirm that students with different specializations and cultures working in teams, enhance a simultaneous knowledge transfer and information sharing on topics related to their field and cultural experiences. As Gassmann [23] and Addler [24] assert, team-members' different values and cultural experiences can increase creativity and innovation. Through MMT collaboration and communication, students can develop critical thinking and problem-solving skills; gain interdisciplinary and intercultural skills; share knowledge with the other members of the team; and gain deeper understanding of the subject from the point of view of different disciplines and cultures. The following notes, recorded on different occasions, point towards that direction:

1. *The current course's student-mix, which includes various majors, results to knowledge sharing based on  different disciplines.*
2. *Students come-up with credible arguments, informing team members and resulting to constructive discussions.*

By observing students' discussions, it was noticed that diversity in their major of study and cultural background has contributed significantly in seeking solutions to problems and challenges by sharing their existing knowledge and skills. However, as explained in the next section, there were also several challenges, which influenced the students' performance.

### *Challenges: Punctuality, Commitment, Learning Styles and Language Barriers*
In her observation diary, the lecturer notes challenges regarding the implementation of MMT through CBL and PBL activities. A notable challenge concerned language barriers as peers were facing communication difficulties, both face-to-face and on Google applications. The following quote from the lecturer's notes is indicative:

*"Some students found the cases difficult to read and faced difficulties to communicate with the others due to language difficulties, both in the class and on Google Hangouts. The ones more competent in English language had to rephrase their arguments in order to explain what they meant. Although discussions took longer, they figured out ways to collaborate and come up with innovative ideas and solutions."*

This finding resonate with previous accounts, suggesting that international students, too, are faced with insecurity and uncertainty in diversified and multi-cultural learning cohorts [42]. But interestingly enough, despite language barriers, what is prominent here is that through MMT, the students who were more proficient in the English language collaborated with the ones facing language difficulties by adjusting their communication styles in order to help them understand the point of discussion. Thus, the team-members improved three components of their intercultural competence, which according to Matveev and Milter, is the improvement of communication, interaction styles and flexibility in resolving communication misunderstandings [43]. It also seems that there was an attempt by some students to develop an inclusive environment for all team members. This is revealing of how a difficult process may strengthen teamwork interaction; make students more considerate, and equip them with skills (e.g. problem solving and negotiation skills) for a career at a global level. In this sense, we may claim that despite the obstacles, MMT through CBL and PBL is a sustainable teaching practice.

However, we should not dismiss or undermine the challenges of the process. On the contrary, some of the difficulties insisted throughout the semester. Table 2 presents some of the main obstacles identified through the observation process.

| Table 3: Ten most common obstacles identified during MMT through CBL and PBL | |
|---|---|
| 1 | Lack of punctuality at teamwork meetings |
| 2 | Lack of commitment to teamwork tasks |
| 3 | Language barriers |
| 4 | Different working and learning styles |
| 5 | Interpersonal difficulties/ preference to work solo 'attitudes' |
| 6 | Difficulty to stick to teamwork's ground rules (e.g. power-off mobile phones during meetings) |
| 7 | Arrive late or fail to show up for the team presentation |
| 8 | Different communication styles/ preferences – physical VS digital |
| 9 | Poor team culture: difficulty of some members to identify with the group |

| 10 | Teamwork stress: unhealthy amounts of worrying/ feeling overwhelmed with the teamwork process |
|---|---|
| Source: Lecturer's observation journal | |

As presented in the opening vignette, some students were not punctual on their arrival. Others were not showing up at all, putting the burden on remaining team members. Some students used to arrive unprepared, or refuse to follow the team's workflow. Also, some differences in working and learning styles resulted to misunderstandings and unproductive conflicts, which influenced the teams' decision-making process. Most importantly, some students failed to show up on the day of the team presentation. At the end of the course, some of these difficulties resulted to lower student-performance, raising doubts about the sustainability of implementing MMT through CBL and PBL. Moreover, as we present below, an attempt has been made to triangulate the observation findings through a student questionnaire.

### B. Students' Questionnaire

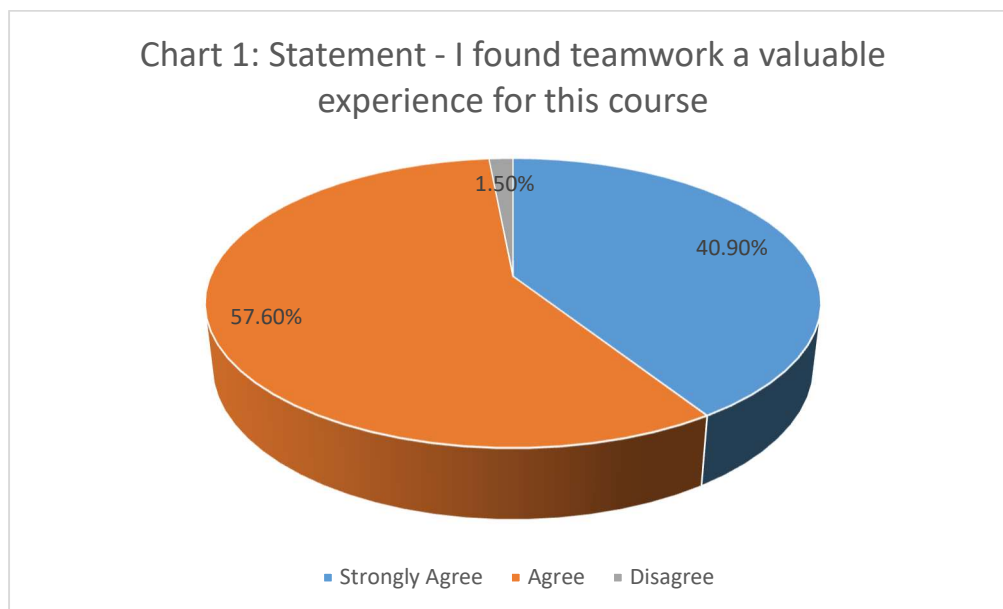
### Demographics

Fifty-nine (59) individuals answered the questionnaire. The majority (47 or 79.7%) were between the ages of 18-24, 11 (18.6%) were 25-34 and 1 (1.7%) above 35. Twenty-eight (28) or 47.5% were males and 31 (52.5%) were females. A large proportion of the respondents (22 or 37.3%) were Cypriots, 6 (10.2%) were Russian, 5 (8.5%) were from Greece and smaller numbers came from other countries (Austria, Bulgaria, China, Egypt, Germany, Finland, Libya, Latvia, Lithuania and Romania).

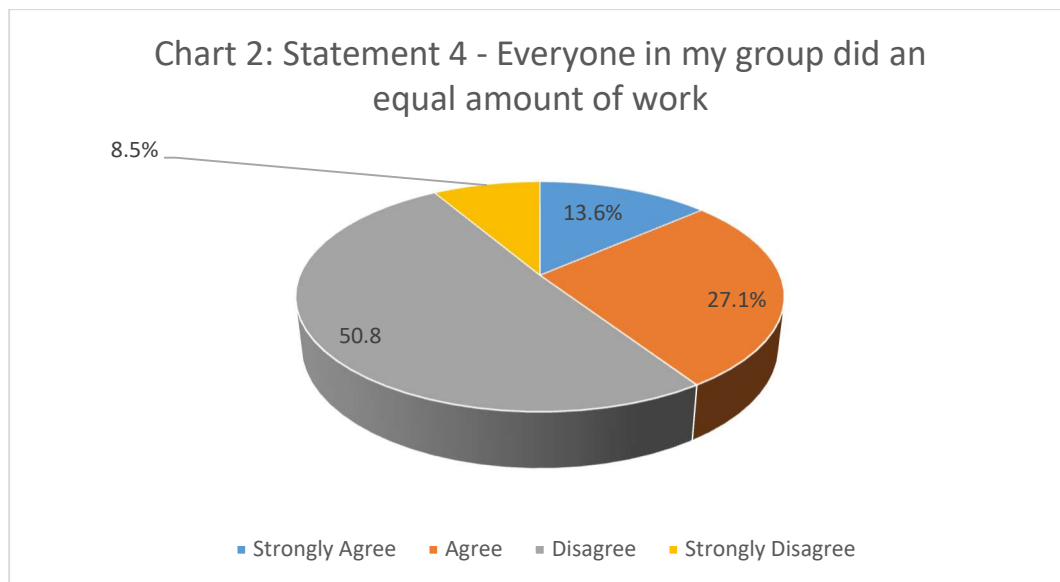
| Table 4: Sample's nationality mix in alphabetical order | | | |
|---|---|---|---|
| 1 | Austria | 8 | Greece |
| 2 | Bulgaria | 9 | Latvia |
| 3 | China | 10 | Libya |
| 4 | Cyprus | 11 | Lithuania |
| 5 | Egypt | 12 | Romania |
| 6 | Finland | 13 | Russia |
| 7 | Germany | | |

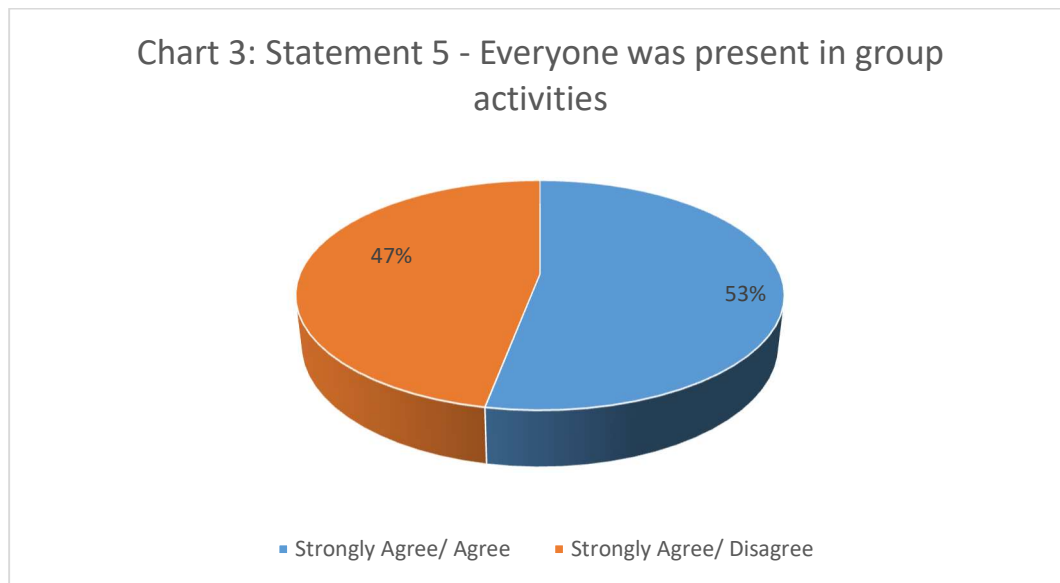
The most common majors of studies were Management Information Systems-MIS (17 students, 29.3%), Business Management (8 students, 13.8%), Marketing (7, 12.1%), Economics (5, 8.6%), and in smaller numbers were Business Administration, Management, Health Sciences and Health Management.

### Students' Perceptions about MMT on CBL and PBL

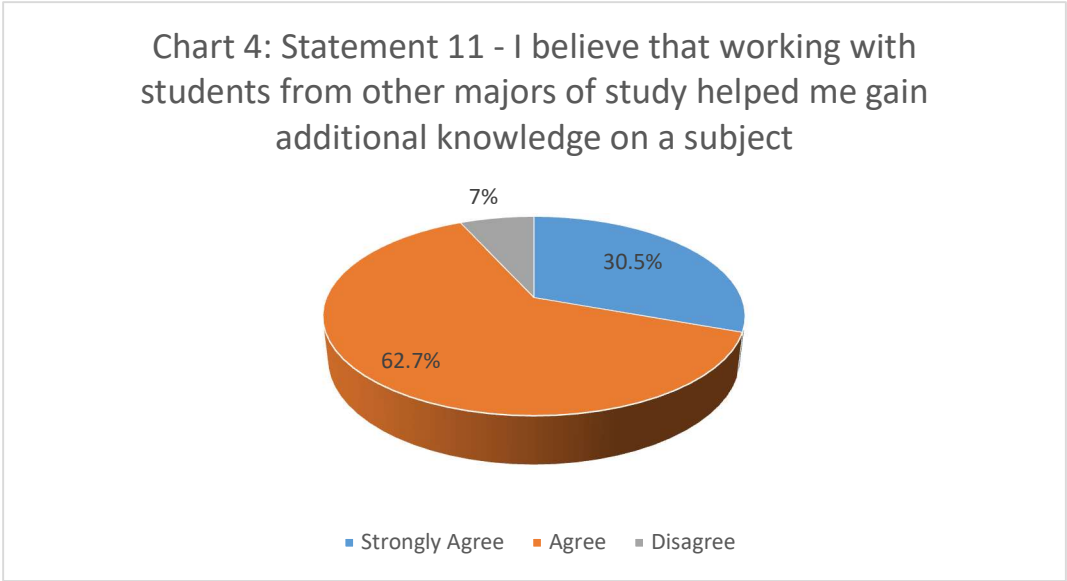
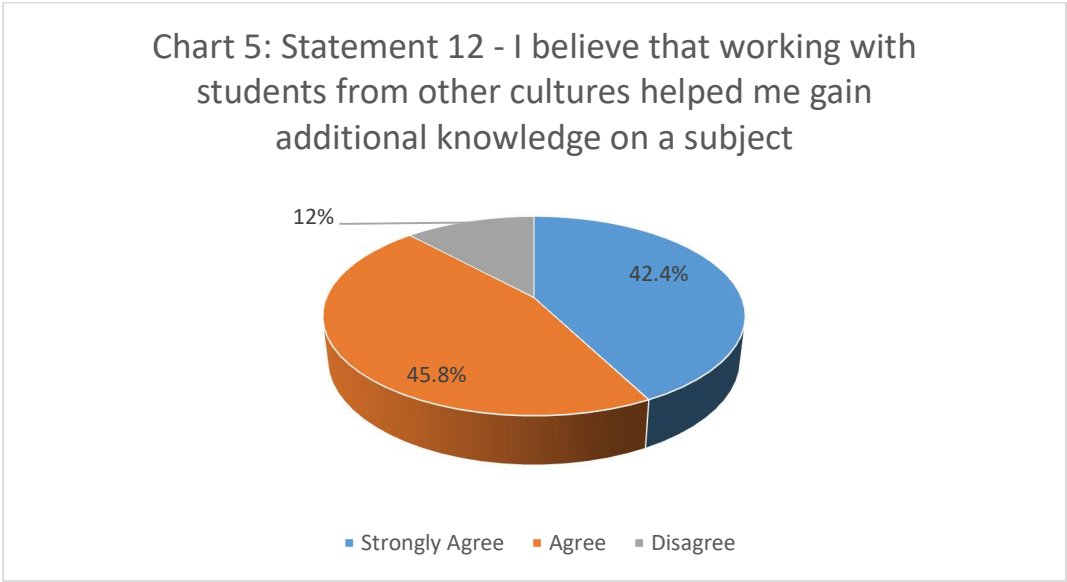
A great majority (46 out of 59 respondents or 78%) indicated that they enjoyed working in teams (Statement 1). More specifically, 17 students or 28.8% strongly agreed and 29 or 49.2% agreed. Regarding Statement 2 *"I found teamwork a valuable experience for this course"*, almost all respondents (58 out of 59) found teamwork a valuable experience for the course (24 students or 40.9% strongly agreed and 34 or 57.6% agreed as presented in Chart 1).

Comparing the results of the first statement with the observation-findings we reconfirm that most students enjoyed working in teams. Despite the challenges, it was prevalent that engagement and interaction among team-members was appreciated by most. At the same time, both sets of findings reconfirm that for some students (22%), MMT through problem solving is not their preferred style of learning. However, compared to the observation's findings, the results of the second statement

point to a paradox. On the one hand, 58 out of 59 responded found teamwork a valuable experience. On the other hand, many students' behavior and actions during observations were diametrically opposed (e.g. as explained in the opening vignette and Table 3, students requesting to prepare and deliver their presentations individually).

Moreover, the discomfort experienced by some students about teamwork (as this was recorded through the observation sessions), has also emerged through survey-statements 3, 4 and 5. The group of respondents were asked to respond to Statement 3 "*Everyone in my group had equal opportunities to participate in the discussions*" and Statement 4 "*Everyone in my group did an equal amount of work*". A small majority (60% vs. 40%) responded positively to the former statement (8 respondents or 13.6% strongly agreed and 27 or 45.8% agreed) while 23 (39%) disagreed and 1 (1.7%) strongly disagreed, whereas a similar majority responded negatively to the latter (5 students or 8.5% strongly disagreed, 30 or 50.8% disagreed, 16 or 27.1% agreed and 8 or 13.6% strongly agreed). This discomfort is reflected clearly in Chart 2, raising concerns about the suitability of this practice as a sustainable method.

Regarding Statement 5 "*Everyone was present in group activities*", the respondents were approximately equally split (53% agreed/strongly agreed whereas 47% disagreed/strongly disagreed). The responses in these three statements resemble the observation's findings, especially

in regard to teamwork challenges. As listed in Table 3, not all members were equally committed to teamwork and tasks. Also, not all members were present and/ or punctual to team meeting – either physically or on Google sites. These findings can also be linked to different learning styles, difficulties to perform teamwork through the learning platform, increased stress levels (as indicated in Table 3), and raise further concerns about the sustainability of MMT through CBL and PBL.

Moreover, while a significant majority (62.1 agreed and 17.2 strongly agreed) felt confident to discuss their ideas with their team members (Statement 6), a large number of students (about 20%) were reluctant to discuss certain aspects. As presented in the opening vignette, a number of students insisted on avoiding a discussion on topics that are considered taboo at home (such as a discussion on how personal data is used).

The majority of students (18.6% strongly agreed, 59.3% agreed) believed that their ideas seemed to count in teamwork (Statement 7). For Statement 8, a noteworthy majority (23.7% strongly agreed, 50.8% agreed) found some of their group members' ideas valuable. Significant majorities also believed that they gained knowledge by working with case studies and problems in teams. More specifically, 86% (28.8% strongly agreed, 57.6% agreed) with Statement 9 *"I gained knowledge by working with case studies in teams",* and 90% (39% strongly agreed, 51% agreed) with Statement 10 *"I gained knowledge by working with problems in teams".*

Finally, the greatest majority of respondents believed that working with students from other majors of study and other cultures helped them gain additional knowledge on a subject. More specifically, for Statement 11 *"I believe that working with students from other majors of study helped me gain additional knowledge on a subject"*, 30.5% strongly agreed and 62.7% agreed, with only 6.8% disagreeing, as indicated in Chart 4.

Similarly, Statement 12 *"I believe that working with students from other cultures helped me gain additional knowledge on a subject"* also received highly positive responses (42.4% strongly agreed and 45.8% agreed) with only 11.9% disagreeing.

By taking into consideration the findings collected through observation and questionnaires, we support that MMT through CBL and PBL can both facilitate and hinder sustainable learning. Some findings highlight the significance of MMT through CBL and PBL. Some students seem to have enjoyed teamwork; found the activity a valuable experience; and gained knowledge by working with case studies and problems in teams with peers from other disciplines and cultures. On the other hand, some students are being divided in their survey opinions about team members having equal opportunities to participate in discussions; being present in group activities; and having equal amount of work. These challenges reinforce further the observation findings and raise concerns about the suitability of MMT through CBL and PBL as a sustainable method. Towards this end, we present in the next section a number of recommendations, aiming at making this practice a more sustainable learning experience.

## Conclusion and Recommendations

The present study investigates the effectiveness of multidisciplinary and multicultural teamwork (MMT) through CBL and PBL pedagogies as a form of sustainable learning. At the same time, within the context of sustainability, the article explores how this process is supported by existing and developing technologies. This paper shows that teamwork and collaboration substantially influence student learning – positively and negatively. For students, certain aspects of teamwork in diversified environments carry different value. As such, teamwork may both facilitate and hinder sustainable learning. For instance, on the one hand, problem-based learning in multi-cultural cohorts is sustainable education inasmuch as it improves students' awareness, critical thinking, and skills to deal with the issue in the real world. On the other hand, it limits sustainable education as our findings suggest that student performance and final results got influenced negatively by the process.

To more accurately represent our interpretation of findings, based on the five dimensions driving the study, we present below a pyramid, which has been adapted by Carroll's Pyramid of Corporate Social Responsibility. Each level of the pyramid resembles one dimension. The pyramid also

presents (in brackets) the value assigned by students to different activities, as observed in the class (physical and virtual) and expressed through the questionnaire. We also use the analogy of Carroll's Pyramid to emphasize the different levels of usefulness and degree of sustainability. At the bottom, students find the specific dimension useful. Also, our findings point to characteristics of sustainability. At the top level, the practice seems to be stretching; its usefulness is uncertain; and results to unhealthy amounts of worrying among team-members (e.g. Table 3).

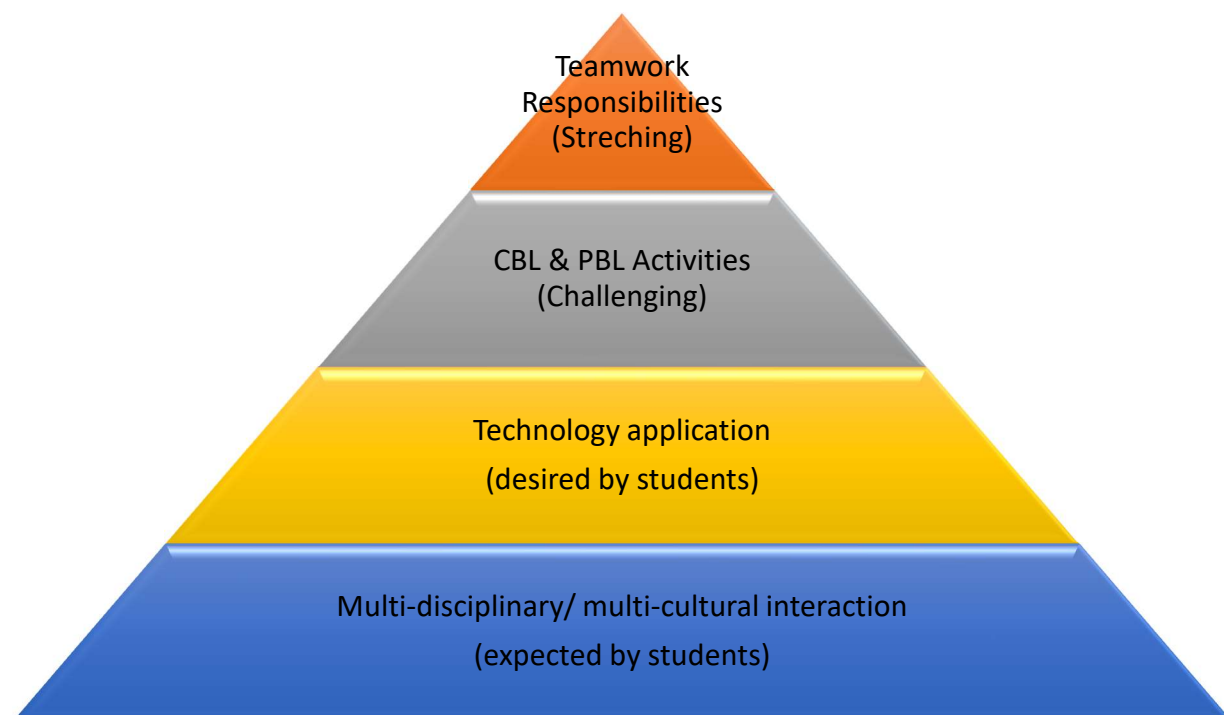



Figure 1: Pyramid of Students Expectations for MMT through CBL and PBL.

To facilitate the sustainable use of MMT through CBL and PBL, we present below a number of suggestions. The Pyramid is used to assist this process.

### *Suggestion 1 – Teamwork Training*

Reflecting on the findings we presented earlier, the 'Pyramid of Students Expectations' (Figure 1) suggests that students seem to assign high value to multi-disciplinary and multi-cultural interaction. Moving onto the second level, it seems that the use of technology in learning activity

is also welcomed by students – rather desired. Then, CBL and PBL seem to become a bit more challenging, whereas, some students seem to be challenged even more by teamwork responsibilities. The *chain of sustainability* seems to break when problem-based activities and student responsibilities are involved. This is not surprising given that students from different educational and cultural backgrounds possess different skills, which in turn influence the way they work. Also, although classroom teamwork may be a common, unproblematic activity to many students and instructors, it is not necessarily appreciated and favored by all students. It's not everyone's preferred way of learning.

Therefore, to improve the sustainability dynamic, our first suggestion concerns 'Teamwork Training'. In other words, teamwork activities need to be mastered in advance. During the first three weeks of the semester, the lecturer may dedicate some time from each lesson to help students comprehend the value of teamwork, the value of peer feedback, how to use rubrics for peer feedback, how to manage their time during teamwork, how to negotiate with team members, and how to lead a team, among others. Also, particular attention has to be paid to providing appropriate training to students for using online applications. Instructors may develop graphics or video materials to assist this purpose.  'Teamwork Training' may add sustainability to MMT through CBL and PBL by facilitating a more concrete engagement and interaction during teamwork. Training may cultivate sustainable grounds, on which, knowledge is generated as part of a social constructivist framework. Learners are trained to take on active roles, while they participate in diversified teamwork, collaborative learning-by-doing, peer feedback and continuous case-based assessment.

### *Suggestion 2 – Involvement of Pedagogical Mentors*
While MMT through PBL and CBL is sustainable practice inasmuch as it improves students' awareness, critical thinking, and problem-solving (statements 7 to 12), the lack of commitment, failure to share workload equally (Chart 2), lack of punctuality (Chart 3), and other challenges (Table 3), reduce MMT to being an unsustainable method (e.g. Chart 1). Therefore, along with the 'teamwork training' we discussed earlier, an attempt needs to be made to help students identify with the team'. To cultivate a team-culture, with shared values, enhanced cohesion, cooperation

and team spirit, we suggest the involvement of Pedagogical Mentors in Week 3. A Pedagogical Mentor could be an agent, such as a tutor, mentor, coach, motivator, industry or professional, who can support educational procedures – such as teamwork at its early stage. For instance, the members of a multicultural team, working on a real-life industry scenario, could participate in a working meeting with an industry professional during the early stages of their teamwork. The industry professional, acting as a pedagogical mentor, can add to the teamwork process by adding market insights, competitive intelligence, technological expertise and strategic understanding of environmental. But most importantly, the addition of 'pedagogical mentors' may mobilise team members to get to work, prior to and after the meeting with the mentor. Valuable information could help the team stick together and work towards a common goal. Pedagogical Mentors may also facilitate learning in virtual environments to improve student engagement

The application of pedagogical mentors will challenge traditional teamwork processes. Unavoidably, students will become involved in new discipline and cultural dynamics. But as we mentioned earlier, internationalization in education is a positive response to globalization [41]. This method is also likely to help students overcome an inherited fear of 'the Cultural Other' [44], that is, fear for issues related to culture, identity and 'fear of the unknown'. Therefore, 'Teamwork Training' and 'pedagogical mentors' should not be treated as standalone tools, but rather, as interconnected mechanisms, with high degree of interdependence, as part of a sustainable teaching effort.

Finally, the participation of students in 'teamwork training' and the involvement of 'pedagogical mentors' in the process of MMT through CBL and PBL, may facilitate a team spirit and the cohesion that is required for enhanced teamwork at all four levels of the pyramid (Figure 1). In turn, the process will help students develop 21st century learning skills; and augment future professional opportunities through sustainable social experiences.

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