Internationalization at home: An international interdisciplinary experience

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Abstract—**In today's global society, international experience is important for students studying all subjects. This paper provides insights and learnings from a long-term project with the purpose to provide international interdisciplinary experience for engineering students in Sweden as well as for marketing students in Australia. The paper discusses the design of the latest iteration of a long-term collaborative project that enables students who do not have the opportunity to engage in exchange studies in a professional international setting. The main objective of this paper is to give inspiration and a starting point to the implementation of international learning experiences as an integrated part of students' education.**

Index Terms— **International experience, project work, interdisciplinary collaboration, engineering education**

I. INTRODUCTION

Engineering is a profession that has a global impact, and it is important that both current and future engineers have a holistic perspective and international understanding of their role in today's global society. Hence, the importance of providing opportunities for international experiences during students' education cannot be stressed enough [1][2]. Berkey [3] states that quality time spent gaining international experiences should include collaborative learning and interdisciplinary exposure. In Sweden, providing true international experiences within higher education is commonly done through international exchange studies. Even though this will, most certainly, always be a top option due to its more immersive experience, there are problems from both sustainability and long-term perspectives. Relying on exchange studies to provide the students with necessary international experiences has proven problematic, e.g., with the Covid-19 global pandemic. Hence, finding a long-term solution to support international intrinsic learning experiences that go beyond guest lecturers, assignments, and having international literature, which are all popular ways to describe internationalization at home, has become more critical for keeping a high level of internationalization. Another perspective that has become increasingly important for engineers is interdisciplinary knowledge and exposure.

Previous studies have proven interdisciplinary collaborations within engineering to be both important, successful and provide a foundation for future engineering courses [4].

This paper describes learnings and challenges of the design of the fourth, and latest, iteration (spring semester 2021) of a collaborative project between teachers and students at an engineering course at Umeå University (UmU), Sweden, and a marketing course at Edith Cowan University (ECU), Perth, Australia. The learnings and discussion presented in this paper are based on individual and group interviews with students, observations during the collaboration, and entry and exit surveys.

II. BACKGROUND

This paper extends the results of a project with the purpose to give students more realistic international experiences on home turf. Even though there are many engineering students engaging in exchange studies, a majority of students do not. Increasing international experiences during the education is important within the engineering education at Umeå University and in Sweden. For the marketing students from ECU, the collaboration was part of the university's drive to create world-ready students. As while study exchange programs are open to Australian students the cost is often prohibitive.

Early results of the project have been reported in, e.g., [5][6]. The long-term goal of the project is to give students increased international experience by exposing them to different cultures, business practices, and joint interdisciplinary collaboration without having to travel abroad [7][8][9]. Within the project, we have a growing body of information to support a positive assessment of this international interdisciplinary collaborative venture. However, during previous iterations, challenges have emerged based on the problem of how to uphold momentum and intrinsic motivation among students regarding the project work. Hence, for this iteration, timing and interaction have been addressed.

Even though there have been different courses and teachers involved in the collaboration since the start in 2017, the course responsible teacher and lecturer at Umeå University and the

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TABLE I
ITERATIONS OF THE COLLABORATION

Iteration	Timespan	Engineering unit	Marketing unit
1	Fall semester 2017	Prototyping for mobile applications	Current issues in marketing (UG)
2	Spring semester 2019	Technology for social media	Current issues in marketing (PG)
3	Spring semester 2020	Technology for social media	Current issues in marketing (PG)
4	Spring semester 2021	Technology for social media	New product development (PG)

UG = undergraduate unit
PG = postgraduate unit

course responsible teacher and lecturer at Edith Cowan University have been the same over the full length of the collaboration. So far, four iterations have been carried out – fall semester 2017, spring semester 2019, spring semester 2020, and spring semester 2021[1] (Table 1). The project was started with three main objectives – (1) Providing opportunities for international experience, (2) providing opportunities for interdisciplinary collaboration, and consequently, (3) provide a learning environment closer to a professional situation that the students could face when leaving the University.

Among the first challenges when starting this collaboration in 2017 were, e.g., (1) too many unknowns regarding the collaboration, (2) lack of knowledge about the respective other student group and their background, (3) the time difference between Sweden and Australia made real-time collaboration difficult and (4) inter-dependence between student groups created problems when deadlines were not met. However, these problems have gradually been addressed and solutions have been implemented, that is, the collaboration and what is expected from the students have been explained more clearly, formal introduction between the two student groups has been improved, and online meetings have been scheduled to take place in the morning in Sweden and in the afternoon/evening in Australia.

Nevertheless, new solutions created other challenges and problems that had to be dealt with. In line with prototyping in a development process [10], we have chosen to work with each collaboration as an iteration towards enhancing both the students' learning and experience as well as our own understanding of creating international collaborations.

The main challenges identified before and to be addressed during the fourth iteration of the collaborative project were:

- *Introduction*. An even better introduction for and of the students that is part of the course to kick-start the collaboration.
- *Interactions*. More interaction and contact between the student groups to encourage collaboration and create a better understanding for the other student group.
- *Collaboration*. Expanded and deepened collaboration between the student groups were requested by the students.
- *Digital tools*. More introduction to the digital tools were demanded due to different knowledge.

- *Timing*. Better timing and synchronization between the two courses and the assignments.

Furthermore, some minor problems that were identified, but did not concern the collaboration, were also addressed during this iteration.

III. LEARNINGS

As this collaboration continues and develops the challenges become less severe and shift more towards details. This is a sign that the main setup of the collaboration has gradually become stable and provides a unique learning experience for both the students and teachers involved. It has become increasingly important to focus on the learning among the teachers to create a sustainable structure for this collaborative project that decreases the amount of energy needed to set this up and run a joint course.

A. Introduction

An even better formal course introduction was given with a real-time meeting with all students instead of some students being introduced by video recording or on a digital platform. This gave a better understanding of the other student group, provided opportunity to ask questions, and made the students more confident for engaging in interaction later during the course.

To give the students at both sides of the collaboration a mutual understanding in marketing and engineering, a couple of new lectures were introduced. This included a lecture on Design Thinking in product development for the marketing students. The Engineering students already had this background and were invited to join, however, since their course had not formally started, they did not join the lecture, but some watched the recorded lecture later. A similar setup was chosen for the engineering students with a lecture on Social Media Marketing to give them a better understanding of the marketing students' background.

This helped the students understand the project and the other student group's industry discipline to a greater depth.

B. Interactions

Interactions have been an important part and the biggest challenge of the collaboration from the start, since the students have had problems to feel engaged to interact. To kickstart interactions and encourage exchange during non-scheduled time, each joint meeting was designed to focus on the students.

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[1] For consistency, the semesters have been denominated according to the Swedish academic year – fall semester (September–January) and spring semester (January–June).

For example, while the general topic of the collaboration was set, the students decided on the specifics democratically, using digital real-time tools. Large parts of the interaction between the students took place in breakout-rooms in a student-active fashion. Teachers were available to assist the students as needed, but their role was that of a moderator, aimed at guiding the students through the sessions. In fact, the main purpose of the scheduled collaborative sessions was to help the students get to know each other and develop a "we"-feeling for a smoother experience throughout the group work.

C. Collaboration

To provide common grounds for collaboration, it became apparent during previous iterations that all students had to be familiar with how the different stages of the development process work. During this iteration, the concept regarding Design Thinking [11], was introduced and used as a framework for development. This made it easier for the students to understand how the different parts of the two courses fitted together into a whole.
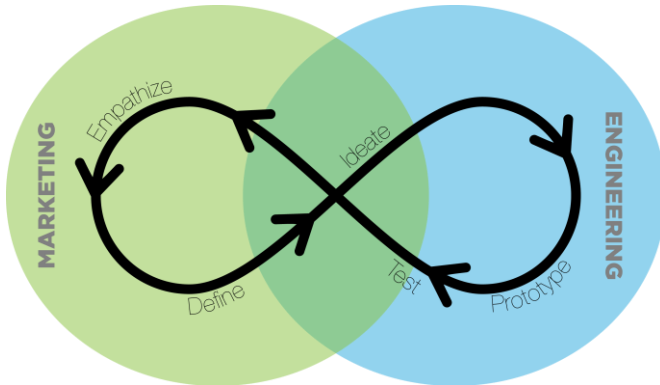

Figure 1. Illustration of how the Design Thinking process [11] was used to frame the students' work during the course and how the different activities were divided and jointly solved.

The different steps in the design thinking process - empathize, define, ideate, prototype, and test [12][13] – were used for the activities during the entire course. Figure 1 illustrates how the different activities were divided between the engineering course and the marketing course, as well as which activities were performed collaboratively. Empathize and define steps were done by the marketing students by gathering data about the target group. A real-time teacher facilitated ideation session done in collaboration between the two student groups and was the main starting point of the collaboration. The engineering students' focus was to prototype and, as much as the time allowed, test the ideas. Some smaller parts of the testing were done jointly, this was, however, not a point of focus for the collaboration.

In addition to the teacher-facilitated real-time ideation sessions, two update sessions from engineering students with unsupervised follow-up group discussions in breakout rooms were included. The final step in the collaborative process was a pitch session where the marketing students pitched their final marketing plans for the engineering students' Hi-Fi prototypes.

The students have engaged actively during these real-time sessions and combining communication tools (Zoom) with collaboration tools (Mural and Padlet) has enabled nearly seamless interaction. Using anonymous voting tools made it easier for students to express their options, which had been a suspected problem previously.

D. Digital tools

One of the first challenges when this collaboration started in 2017 was to get all students onto one education platform (e.g., Moodle, Canvas or Blackboard), since it was problematic to add students not formally enrolled at the university. Unfortunately, the situation has not improved since, and instead, other collaborative platforms have been used over the years. However, there have been problems to get all students to understand these platforms (e.g., Slack). During this last iteration Microsoft Teams was chosen since more students have previous experience using it. Nevertheless, the asynchronous interaction through Teams is clunky as students easily forget to look for notifications from their counterparts in the other country. Teams does not seem to create the same urgency as social media and students tend to not install the application on their smartphones.

Zoom has been used from the start as a real-time platform for presentations and collaboration. Even though this has worked well, the sessions need to be set up by the involved teachers and were limited to the scheduled meetings. When using digital tools in educational settings, they should, foremost, be chosen based on how they support the pedagogical ideas of the setup [14]. The digital tools provided by the universities had to be complemented with tools that supported the pedagogical idea of the collaboration. Hence, collaborative digital tools were introduced to increase the interaction and collaboration between the students both in real time and asynchronously. Consequently, the digital tools used during this collaboration were chosen due to their pedagogical surplus and not only based on them being part of the Universities' normal digital pedagogical tools. The platforms used during this iteration were Padlet and Teams for posting summaries of work and to make comments, and Mural for real-time collaboration regarding e.g., ideation. The students were generally positive about the use of these tools and platforms and believed they increased the collaborative learning experience.

It should be noted that the general knowledge and, among students as well as teachers, regarding the use of digital tools has increased significantly due to the emergency remote teaching situation during 2020 and 2021.

E. Timing

One major challenge is the differences in academic year between Sweden and Australia. In Sweden, the academic year runs from September to early June and consists of two semesters each divided into four 7.5 ECTS reading periods. In contrast, the Australian academic year starts in January with two teaching periods end of February to early June and the end of July to early November. Since the engineering courses at Umeå University are mostly at 50% pace and start either in the
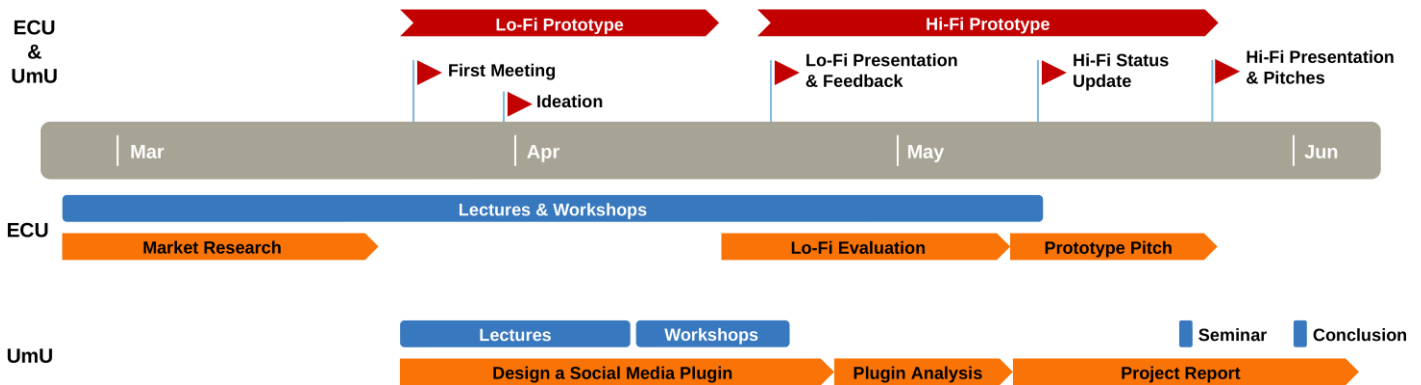
Figure 2. The timeline of the collaboration during spring semester 2021 between Umeå University (UmU) and Edith Cowan University (ECU). The collaborative learning activities that involve the student groups from ECU and UmU are shown above the timeline in red, meetings between student groups at ECU and UmU are shown with flags. Further learning activities and individual assignments are shown below the timeline in blue and orange, respectively, for both ECU and UmU.

beginning of a semester or mid-semester, they are misaligned with how the courses start in Australia. This challenge was dealt with by inviting the Swedish students to participate in short meetings before their course officially started. Nevertheless, since it was not mandatory and outside the timeframe of the course, about half of the students participated.

Since the marketing students had been working on the course approximately one month before the engineering students started, there had been problems in timing of the assignments on the two courses. By focusing on the design thinking process, it became clearer for the students what had been done during the first month of the marketing course when the marketing students had been gathering data on the target group for the application (empathize and define).

Furthermore, the general timing of the classes was addressed by carefully aligning all assignments between the courses and scheduling meetings for the full length of the collaboration. A timing was created that constantly pushed the two student groups forward in their work with the goal to make the courses feel aligned. Figure 2 illustrates how the collaboration was set up and presented to the students. Roughly, the collaborative project consisted of five parts. First, a market research phase done by the marketing students at ECU. Second, a joint ideation session based on the market research results to define the basis for the Lo-Fi prototypes to be implemented by the engineering students at Umeå University. Here, the student groups began to work together actively and discussed what is possible from a technical point of view and what makes sense from a marketing point of view. Third, presentation of and feedback for the Lo-Fi prototypes that laid the foundation for developing the Hi-Fi prototypes. Fourth, developing the Hi-Fi prototypes with continuous non-scheduled bi-directional feedback between the marketing and engineering groups. And fifth, the final session where the engineering students presented their Hi-Fi prototypes, and the marketing students delivered their pitches for the Hi-Fi prototypes.

IV. CONCLUDING DISCUSSION

When this project started, the main idea was to give students who did not have the opportunity to go abroad a more professional international experience. However, as the project has evolved during the four iterations since 2017, it has become apparent that all students, independent on whether they have been international exchange students or not, will have a new and enhanced learning experience. The focus has been on creating an environment that students might face in their future profession when working with a department or agency outside their profession.

Even though there are still challenges that need to be addressed to further strengthen the setup, the results show that it is possible to integrate courses from different disciplines and countries to create value for the students.

Based on our learning from running this collaborative project over the years, we provide a list of things to keep in mind when setting up an international interdisciplinary collaboration within teaching:

- The teachers should make sure to understand the setup of the respective courses to be able to give students the best possible guidance and clarify misconceptions.
- Depending on disciplines, some sessions that provide students with the required background knowledge to understand their peers/counterparts may be necessary.
- Digital tools should be chosen with usability and simplicity in mind and such that they are equally accessible to everyone.
- Collaborative group projects between the courses should be inter-dependent to ensure that all students participate in the international experience. However, examination-critical parts should remain largely independent to minimize uncertainties for students and give them control of their possibilities to finish the course on time even in case of problems with the collaboration.
- Emphasize strengths and opportunities of the collaborative teaching project but be open to students about aspects that do not work well yet; invite students to be co-creators and encourage them to speak up in case of problems.

- Check holidays in the different countries involved when scheduling meetings and assignment deadlines.
- From the start, emphasize the professional skills and experiences that the students can gain by actively engaging in the collaboration.

During fall semester 2021, a fifth iteration of this collaborative project is currently in the making. This iteration will mainly focus on creating a better interaction between students on the two courses. Furthermore, the digital toolbox will be more integrated to increase the student engagement during real-time interactions.

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