Enhancing entrepreneurial skills through creativity, diversity and collaborative online international learning

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ABSTRACT

This paper evaluates staff and students' perspectives of an entrepreneurial Collaborative Online International Learning (COIL) project that examines students' creative thinking and practice, whilst working across three different countries, institutions, and educational systems, with the total student body representing multiple nationalities. The diversity of the students' backgrounds and experiences is at the heart of the paper, which seeks to identify the links between the experiential learning undertaken, the diversity of a group and its subsequent creative outputs. The paper aims to evaluate the extent to which international, online, interdisciplinarity group work fosters creative learning environments, specifically evaluating the effect of an entrepreneurial task, and the impact of differing educational levels, subject fields and location.

The ability to work in a heterogeneous team comprising different backgrounds, locations, and practices is a significant challenge for international collaboration online. This paper evaluates the extent to which the growing concerns around students' ability to articulate how their learning transfers to the world of work are addressed by COIL projects, using a series of in-depth interviews with the staff and students from all three institutions.

The key implications and recommendations for educators are that structured communication, small group interactions and a supportive environment encourage creative freedom and are critical to the success of the COIL, without which the students' ability to create is diminished. By embedding applied practice within courses, educators provide the necessary scaffolding and space for students to learn in real-world scenarios, enhancing their employability and readiness for the global workplace. Upon evaluation it became clear that whilst COILs are inherently of value in a broader sense, the interdisciplinarity of the students' subject knowledge *itself* is a critical factor in determining the success of the project.

Keywords: Collaborative Online International Learning (COIL), collaborative creative practice, creative thinking, interdisciplinarity, international education

Introduction

This paper evaluates staff and students' perspectives of an entrepreneurial Collaborative Online International Learning (COIL) project that examines students' creative thinking and practice, whilst working collaboratively across three different countries, institutions, and educational systems: Robert Gordon

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University (Scotland), Sinclair Community College (United States of America), and Seneca Polytechnic (Canada), with the total student body representing seven nationalities. The paper evaluates how the different disciplines of the students, the academic levels of their studies, and the nature of their institution help facilitate creative learning environments. Motivation for this paper was driven by the shared expertise across the team in COIL programmes, their implementation and impact and with a shared interest in the role of teamwork and how it shapes the creative and entrepreneurial skills of students. The team has explored how the structure of this COIL project and the associated range of students contributed to those outcomes, allowing for a deep reflection and evidence-based research approach to further enhance future delivery.

Robert Gordon University (RGU) has had ties via international pathway provision, summer schools and visiting academics with Sinclair Community College and Seneca College respectively as part of their internationalisation strategy for several years. This specific COIL was born from these links and was launched in 2021 with collaboration between two of the authors, T. Pirie and Richardson. A third partner, Seneca, joined the collaboration in 2023 led by another author, Spadafora. The project involves students working in small teams to create a new business proposition, identifying the target market and creating an associated marketing strategy for its launch. COIL projects can take various forms (Crawford, 2021) and this project allowed students to create together, however the formative and summative nature of the assessments were specific to each institution thereby accommodating the difference in academic levels, from undergraduate to postgraduate, while still facilitating creative, collaborative, and experiential learning (Kurni & Saritha, 2021). With the first iteration occurring during the pandemic, there were additional 'delivery' pressures for both staff and students, e.g. the 'always on' pressures felt by staff and the potential lack of structure students faced (Connan & Pirie, 2022), however there were also benefits of online group interactions that differed from traditional face-to-face activities, including a more flexible and efficient mechanism for group activities and students being more willing to share ideas (Goldie et al., 2023). By 2023, with two iterations complete, Seneca joined a well-established process, whilst adding a different cognate group to the project, with students studying Fashion Communication joining the Marketing students of RGU and Management students of Sinclair. The diversity of the students' backgrounds and experiences is at the heart of this paper which seeks to identify the links between the experiential learning undertaken, the diversity within the group and its subsequent creative outputs. Working in a heterogeneous team comprising different backgrounds, locations, and practices is a significant challenge for international collaboration online (Crawford, 2021). With increasing literature focusing on authentic assessments (Villarroel et al., 2018) students' ability to articulate how their learning transfers to the world of work (Goodwin et al., 2019), and the increased importance of students cultivating transferable employability and entrepreneurial skills (Royle, 2023), including communication, problem-solving, and critical thinking (Bremner et al., 2024), it is clear that COIL projects can offer a valuable addition to curricula of further and higher education institutions, as observed by the partners, and providing further motivations for this study to explore the level of impact these experiences had on their student community.

This paper aims to evaluate the extent to which international, online, interdisciplinarity group work fosters creative learning environments (Kurni & Saritha, 2021; Goldie et al., 2023), specifically evaluating the effect of an entrepreneurial task (Crammond, 2023; Royle, 2023), and the impact of differing educational levels, subject fields and location (Swartz et al., 2020; Crawford, 2021). Therefore, the study seeks to address the following research questions:

RQ1: How does the interdisciplinarity of a COIL group impact its creative thinking and practice?

RQ2: How does the composition of a COIL group impact its creative thinking and practice?

RQ3: How does the process of conducting a COIL project impact its creative thinking and practice?

The following will incorporate exploration of creativity, entrepreneurial mindsets and the role of interdisciplinary group work in facilitating and enhancing this process for a diverse range of students, whilst identifying the importance of a qualitative approach to data collection so that a deep and meaningful understanding of the lived experiences of both students and staff can be exhibited, allowing for analysis of the work to contribute insights to the future development of this COIL project to enhance further the skills sets of future cohorts.

Literature review

Creativity, interdisciplinarity, and the entrepreneurial mindset

Creative thinking and innovation are particularly important transferable skills for graduates entering the global workplace because rapid advances in technology combined with geo-political and economic uncertainty place increasing pressure on organisations to find new ways to stay ahead of the competition (McKinnon et al., 2015; Smith, 2016; Swartz et al., 2021; Sambale et al., 2023; World Economic Forum, 2023).

Higher Education, therefore, has a responsibility to help prepare students for this reality and to incorporate authentic global learning experiences within the curriculum. Collaborative Online International Learning (COIL) is an innovative learning pedagogy that offers a rich international learning experience for participants (Rubin & Guth, 2023). Originally developed by SUNY (State University of New York) in 2002, COIL is part of the growing field of Virtual Exchange where students in one country collaborate on a project with students in another country, using freely available online tools and a combination of synchronous and asynchronous communication (SUNY COIL Center, 2024). COIL projects are typically composed of highly heterogeneous groups including different disciplines, backgrounds, levels of learning, professional and academic experience, time zones, languages, and cultures which can help to internationalise the curriculum (Swartz et al., 2020). This heterogeneity adds a higher level of complexity than standard group work in a single classroom and research has shown that it can be particularly useful for the development of transferable skills such as problem-solving, interpersonal communication, innovation, and negotiation (Crawford, 2024). Evidence has shown that students have the capability to take skills developed in these settings and apply them to their wider personal and professional opportunities (Smith, 2016), further demonstrating the value of projects such as COIL.

Creative thinking and practice are among the transferable skills that COIL projects have the potential to cultivate because they are encouraged through interdisciplinary group work, heterogeneous group composition, and exposure to new intercultural and digitally-driven processes, all of which require participants to 'step outside their comfort zone' and 'think outside the box' (Crawford, 2021). COIL projects align with Lin's (2011) three-element framework of creative pedagogy that seeks to offer a more holistic view of enhancing creativity through teaching, where creative pedagogy constitutes a multi-directional

interaction between creative teaching, teaching for creativity, and creative learning while possibility thinking (Cremin et al., 2006) and a supportive environment promote learner autonomy.
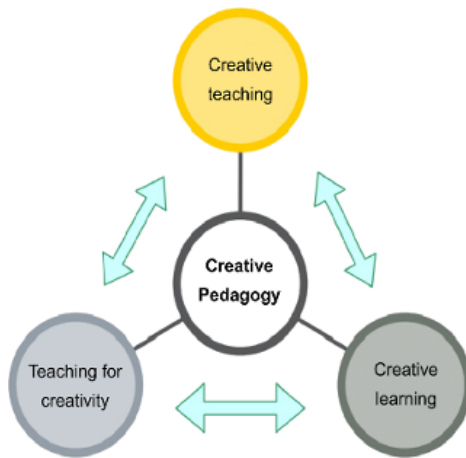

Figure 1. The three elements of creative pedagogy (Lin, 2011).

Recent research has linked creative thinking and innovation to the development of an entrepreneurial mindset, where Daspit et al. (2023, p. 17) define an entrepreneurial mindset as "a cognitive perspective that enables an individual to create value by recognizing and acting on opportunities, making decisions with limited information, and remaining adaptable and resilient in conditions that are often uncertain and complex". The link between entrepreneurialism and creativity is examined further by Bremner and Air (2023) who argue that classroom projects that promote curiosity and creative thinking can produce innovative results such as problem-solving and opportunity identification. This is reinforced by Anderson and Air (2022), who suggest that social learning can develop creative entrepreneurial graduates because it extends observational and concrete experience which Kolb (1984) linked to the development of creativity. Royle (2023) argues that problem-based learning and experimental pedagogy in a safe environment can encourage students to try new approaches and create something new. This is expanded by Iddris (2024) who found that entrepreneurship education can have a positive influence on participants' international entrepreneurial intention, whilst McKinnon et al. (2015) identified that students in COIL projects would generally develop their understanding of issues such as entrepreneurship and innovation. These findings may suggest that entrepreneurship education is a good match for international collaborative learning approaches such as COIL.

The manifestation of creativity through interdisciplinary group work

COIL projects are suitable platforms for interdisciplinary groups and creative problem-solving because they are intrinsically heterogeneous and promote new ways of seeing and thinking about global problems. However, the link between creative thinking and COIL is less clear. Gardner (2009) highlights studies of human subjects that suggest that creative problem-solving draws on the same information-processing skills as everyday problem-solving implying that creative problem-solving is a skill that can be developed through problem-solving activities such as entrepreneurial COIL projects. He argues further that a synthesis of disciplinary perspectives is necessary to understand the sociological, historiometric, and neurobiological conditions that produce creative outcomes. Creativity, therefore, is the result of a combination of internal and external factors that can only be fully understood through an interdisciplinary lens.

Subject-related interdisciplinarity within a groupwork context can have a positive impact on creative thinking and practice because it encourages participants to consider new perspectives on a shared problem and negotiate solutions that traverse traditional subject boundaries. Srinivasan et al. (2022) found that creativity can be triggered with well-defined pedagogical approaches such as integrating curricula. This is reinforced by the work of Liu et al. (2022), which found that students from nursing and design who were allowed to participate in an interdisciplinary project scored significantly higher on creativity measures than the control group. Therefore, it could be argued that COIL projects that adopt an interdisciplinary approach to group work may be more successful at developing creative thinking and approaches.

The composition and team dynamics of COIL groups may have an impact on personal and professional growth, whilst a project that comprises students from different countries, cultures, courses, disciplines, professional and academic grounds, and level of study may encourage participants to work harder to be heard and understood (Swartz et al., 2021). However, this can be challenging, particularly when time zones, language, institutional frameworks and processes, and personal commitments don't align easily (Swartz et al., 2020). The ability to overcome these challenges can promote personal and team confidence, and build resilience, and leadership capability, however if they are not resolved it could be counter-productive in terms of personal growth, creativity, and the desire to try new things (Swartz et al., 2020). An effective COIL project design, therefore, will be cognisant of the potential benefits and risks involved in the group composition, its management and support. If appropriate group composition and support does exist, it can create a safe place for participants to experiment, think creatively, and perform to their best (Royle, 2023).

COIL groups that involve more than one nationality can increase the range of experience, perspectives, and ideas that are brought to bear on a problem. In a study of a COIL project involving four countries, Swartz et al. (2020) found that students reported a heightened awareness of the difficulties of intercultural communication, and despite a general appreciation of the project and its outcomes, negative results emerged, e.g. an increased dislike of intercultural interaction. Intercultural sensitivity and intercultural competency can be developed through COIL if an appropriate structure and support are provided, enabling diverse perspectives to enhance the quality of the learning experience and outcome; however, it can be counter-productive if the project fails to address the participants' fears and concerns. Research by Hackett et al. (2023) also measured the effect of COIL on intercultural competence development using a quasi-experimental design with students in the Netherlands and the United States of America (USA). There was a significantly larger increase in intercultural competence for the experimental COIL group than in the USA-based, non-COIL, control group which reinforces the value of diverse, international, group composition for the development of critical transferable skills.

The COIL process and creativity

The COIL process, including the structure, timing, and syllabus of the COIL project, may contribute to the development of creative thinking and the creative thinking process. COIL projects that include individual and collective reflective touch points at the beginning, middle, and end of the project encourage participants to scrutinise their own and others' performance, knowledge, and skills, and identify where improvements can be made to achieve a more effective group and individual outcome (Rubin & Guth, 2023). COIL projects with a shorter timeframe (e.g. 5-6 weeks) may increase the pressure to devise creative solutions whereas longer COIL projects (e.g. one or more semesters) can afford more time to experiment,

receive formative feedback, and explore alternatives (COIL@UArctic, 2024). If the syllabus includes resources that are designed to promote creative thinking and practice this may also encourage participants to adopt and apply some of the learning from them (Lin, 2011).

While a clear structure and support are necessary to help mitigate some of the inevitable challenges of heterogeneous, international group work (Swartz et al., 2020), COIL projects that are student-led and allow participants to navigate challenges and identify solutions may be more likely to promote creative thinking (Anderson & Air, 2022; Bremner & Air, 2023; Royle, 2023). Therefore, a constructivist approach to COIL where a framework for learning and resources are provided enabling participants to build their learning is recommended (Bremner et al., 2024). Swartz (2020) found that COIL projects can also help to develop the transferable skills of the faculty who are involved in its design and implementation. COIL projects are typically created using similar processes to a COIL project i.e. faculty communicate and collaborate online, navigate geographical, cultural, and time zone differences, draw upon diverse academic, subject-related, and professional knowledge and experience, and make use of existing tools and resources to solve problems and create innovative solutions (Swartz, 2020). This adds an extra layer of authenticity to the COIL project for students because their tutors can refer to their own experiences of COIL, empathise with the challenges, and articulate how it helped to develop their own creative thinking and practice.

Methodology

Numerous studies focus on the challenges of delivering COILs (Swartz et al., 2020; Rubin & Guth, 2023), however investigations focusing on how the interdisciplinarity of the COIL's students affects the creative thinking and practice of each individual is under-researched. This study therefore took an exploratory, interpretivist and inductive approach that builds on the literature's key findings but allows some flexibility with data collection and analysis (Brinkmann, 2017). A qualitative approach was selected for the study, specifically a series of in-depth interviews with representatives of both COIL staff and students.

With the investigation's fundamental tenet being to evaluate the impact of interdisciplinarity on creative learning environments, testimonies from both staff and students from each of the three COIL partner institutions were sought, exploring the entrepreneurial focus of the project itself, the different educational levels and locations of study, and their impact on the overall learning experience. To gain an in-depth understanding of the individuals' lived experiences in-depth, semi-structured interviews were deemed the most appropriate approach over other forms of data collection (Savin-Baden & Major, 2022), with the recognition that interviews provide a widely recognised and appropriate method to explore lived experiences of participants (Johnstone, 2017), a core focus of this study. This allows for meaningful areas, unique to the individual to be explored, whilst also ensuring common themes of exploration (Braun & Clarke, 2021). A non-probability, purposive sampling technique (Wu & Thompson, 2021) was adopted to select the appropriate participants, i.e. those who can give a meaningful contribution to a discussion of the topic (Honigman, 1982), namely the COIL staff and students. This form of convenience sampling lends itself well to qualitative studies and is frequently used in educational studies (Golzar et al., 2022). With the study spanning across multiple years of the COIL project, and the dispersal of students post-studies, adopting this approach facilitated the researcher's ability to contact students still available to them, which maximised the team's ability to gain understanding of the rich and meaningful experiences students had with these COIL experiences.

Interviews with the students were conducted by the COIL partner authors, T. Pirie, Richardson and Spadafora, with each scheduling interviews with three of their home institution's students. Their being known to the students enabled free-flowing conversations reflecting on the COIL project, with the interviewers able to recall specific incidents and use a common language due to their shared experiences (Knott et al., 2022). The COIL partner authors were themselves interviewed by E. Pirie and Crawford: whilst both have experience of international collaborations and COILs, they were both *detached* from the specific COIL investigated here, with neither having direct involvement in its delivery, as such they were able to approach the questions and subsequent analysis from a more objective and reflexive position (Turner & Pirie 2016). This *detachment*, as discussed by Elias (1956, 1987), that E. Pirie and Crawford could take to the discussions was of importance here as this helped remove any potential bias from the analysis process, with neither having any pre-judged outcomes due to their lack of involvement with the particular COIL or its students.

A total of 12 in-depth interviews (nine students, three staff) were conducted, ranging from 30-80 minutes in duration, with seven nationalities, and six programmes represented across the COIL's three institutions, coded as follows: Students, RGU1-3, SCC1-3, SP1-3; Staff A1-3 (Authors, Richardson A1, Spadafora A2 and T. Pirie A3). Although the sample was purposive in design (Wu & Thompson, 2021), the relatively small sample restricts the ability to generalise the findings to a larger student or staff population (Golafshani, 2003). The team followed RGU's Research, Governance and Ethics policies and received approval from the School's Research Ethics panel (Robert Gordon University [RGU], 2024). The staff and student interviews were scheduled concurrently, i.e. the design and results of one did not alter the design of the other (Cresswell & Cresswell, 2018) over a two month period and were conducted and recorded via MS Teams, as students were generally unavailable on campus. The researchers used a thematic analysis approach to address the Research Questions. Thematic analysis is appropriate for phenomenological research (Joffe, 2011) due to its flexibility and capacity for differing viewpoints to be presented and, given the duration of interviews and the individuals' differing backgrounds, the use of systematic process was essential for grouping, analysing and generating meaning (Vaughan & Turner 2016). Following transcription and coding, interviews were then organised into themes that informed the discussion of the Research Questions (Braun & Clarke, 2021).

Findings and discussion

The following evaluates the relationship between diversity, creativity and the development of entrepreneurial skills through COIL projects, by addressing the three Research Questions outlined in the Literature Review by analysing staff and students' perspectives on each.

The impact of interdisciplinarity on creative thinking and practice within a COIL project

Echoing the work of Rubin & Guth (2023) and Swartz et al. (2020), student interviews revealed positive perceptions about the variety of individuals in the group and their respective backgrounds. Students acknowledged the benefits of their different professional backgrounds, experienced both with the host institution and those with whom they were partnered, as highlighted by RGU1 "there was quite a good variety of students already from different backgrounds…. And then you throw this partner university into the mix ….., you'll see people with different talents, and different opinions".

The benefits of the multi-layered level of diversity, skills, and viewpoints to which students were being exposed during the creative process were acknowledged by SP3, "cross-sectional thinking can lead to brand new, amazing ideas…. you're figuring out, how can we put these together?" This was also noted by staff with A1 agreeing it gave an additional perspective and A3 adding: "We had a multitude of different viewpoints ….. from a different perspective, which … can really enhance the experience". These comments highlight the powerful role that interdisciplinarity and collaboration can have in developing creative ideas and reinforce Gardner's (2009) assertion that creativity is the result of a combination of internal and external factors that can only be fully understood through an interdisciplinary lens.

Students, e.g RGU3, recognised the role diversity had in allowing them to be both more educated and creative as individuals, with SCC2 noting that it improved their ability to undertake robust and well-cited research as opposed to what they have experienced in their home country. Staff also noted the benefits of different disciplines working together, "fashion communication students do a lot more around visuals, so …. the output could be enhanced" (A3). This was further highlighted in relation to the type of product that the groups focused on. Here, student reflections were not subject-related but instead focussed on the impact of the cultural diversity and terminology used in relation to different product categories, e.g. SCC1 shared "We picked chips. And they were like, 'what are chips?' So that was very interesting in the fact that we were thinking, that's universal, but that's not been the case." The self-reflection demonstrated by students was mirrored by the staff who also reflected on their differences and how this aided their understanding and approaches: "You know for me just hearing [A3's] perspective on what she's studying….. and [A2's] expertise in what she's doing now with her family business. So, I've learned …. in terms of marketing subject and teaching experiences" (A1). This type of personal reflection and growth that COIL can produce in its participants is noted by other authors including Swartz et al (2021) and Rubin and Guth (2023); and a willingness to embrace new ideas is an important factor in the stimulation of creative thinking and practice (Royle, 2023).

Importance was attached to how the COIL project allowed participants to be exposed to the benefits of receiving constructive criticism, and how being receptive to it allows for a process of building on the creative ideas that are being developed, "not everybody is at the same level in terms of like their knowledge, and how creative they are... it's okay to get help from other people, or to learn from other people because you're going to do that when you're in a career." (SP1) By creating a safe place for constructive criticism and alternative ideas to be offered and received positively, COIL projects align with the work of Lin (2011) and Cremin et al. (2006) where creative teaching, teaching for creativity, and creative learning combine to enhance creativity.

Students' understanding of the longer-term benefits on their creative processes was evident in the way they spoke about the interdisciplinary nature of their groups, and how this allowed them to experience the creative processes they can expect in a professional environment, "If everyone's willing to compromise a little bit and talk things out [we]… can really produce some great ideas" (SP3). Staff noted that the quality of the outputs in COIL was higher than in other, similar, classes they ran with no COIL present: "I don't see the same creativity as I did in this class; like the ideas… were extraordinary in some cases" (A2). These findings suggest a level of reflexivity in the student participants which they may not have experienced during their studies without a COIL project being embedded. They also highlight the continued relevance of authentic learning pedagogies for the development of transferable teamwork skills that are necessary for the workplace (Crawford, 2021; Swartz et al, 2020).

The impact of a COIL group's composition on its creative thinking and practice

Students perceived that their creativity was increased by taking part in COIL, with the structure of COIL giving them creative freedom on various levels, "...I'll struggle to come up with an idea...However, if I get even the smidgen of something, I can take it and run with it. I just need that somebody to kick start it..." (RGU1). Discussions showed the structure of COIL enabled students to voice their opinions in an open and safe environment, "I was able to connect more with my peers... There's no judgment." (SP2). The structure of COIL allowed students to share ideas freely, with students feeling they could express themselves and felt safe to do so (Swartz et al., 2020) also allowing them to connect with each other and appreciate the importance of team dynamics. In alignment with Royle (2023), COIL allowed them to gain self-confidence, in sharing their innovative ideas in a safe, comfortable environment, which was not obstructed by group dynamics, variation in educational level, cultural background, or age differences. Some felt this diversity was a facilitator for new ideas and enhanced future opportunities to debate creatively, "if everybody has different opinions and then you debate on it...it develops your skills more." (RGU3), a view supported by the teaching team "I think it (interdisciplinary) was quite significant.... it was giving them that different worldview because we had students that were at different ages, genders, cultures, levels in their studies". (A2)

Students identified group dynamics and group roles as factors that allowed for individual growth and development. Group members' diversity created a natural interest to learn from each other providing a respectful and safe learning environment. These conditions empowered students to become more expressive and accept unfamiliar or challenging roles. Open communication is vital here and respecting other people's beliefs, and opinions, allows students to listen and learn from one another. The quality of ideas was also highlighted by the teaching team, "they were so caught up in the creative process because they were given input from Scotland...from the States... things they created were just incredible... brands that we wouldn't .. think about .. here in Toronto" (A2). These constructive comments suggest the COIL project provided the structure and support necessary to overcome the type of logistical concerns identified by Swartz et al. (2020).

Feedback from both students and staff confirmed that the structure of COIL gave students the ability to improve their skills on multiple levels, freedom of expression, leadership skills, collaboration, feedback and presentation skills. Students gained self-confidence e.g in their presentation skills (RGU2) and development was also evident to the staff, "it allows them the freedom to express and grow…and you know it was almost like a kind of freeing opportunity …. They had permission to be creative." (A3). Consequently, the structure of the COIL project impacts student creativity and development across numerous planes, reinforcing similar, previous studies (Hackett et al., 2023).

The effect of a COIL project's processes on the groups' creative thinking and practice

The COIL process lasted five weeks, after which students continued to work collaboratively to create their final output – a recorded presentation. The COIL project processes positively impacted the groups' creative thinking and enhanced the learning experience. Specifically, small groups allowed easier communication, the open-ended project allowed for a richer learning experience, and brainstorming is now a tool in their professional skills toolbox. The small groups' format helped facilitate communication. SP1 noted, "You can have a whole bunch of ideas.….. not gonna come up with a result that will fit the project. You need a

step-by-step process and then have that welcoming environment" SCC3 provided a similar perspective through a different lens, "COIL emphasized active thinking. There were many discussions between students... It was helpful because it gave me the ability to be brave." The teaching team noted that the independent nature of the process students follow was an important one, with A3 identifying the benefits for their students in preparing for their final creative output, "in terms of the difference [between typical classroom-based group work and COIL] is that autonomy that the students are given...."

Small group discussions facilitated creative collaboration and compromise. SP3 stated, "COIL wasn't like any project we had done before. We're going to have to come up with creative solutions around creative collaborations," the wider importance of which was noted by A1, "I believe the students have learned how to connect with people from overseas, which is super important in business". SCC2 shared, "When we worked in a group…we were getting more ideas." The open-ended format of the project resulted in a rich learning experience for the students. RGU2 expanded on this, "It was exciting to come up with this new business idea... we had that freedom to think .. so the creative process or the creativity …. behind this project is the fact that we had room… to explore." The brainstorming process proved beneficial and is now a skill that students actively use regularly.

The benefits of COIL extend outside the classroom and have broadened students' approaches, with SCC1 stating "I'm a non-traditional student, I have a business. [COIL] opened my thought process to maybe not just in the U.S. but global." RGU2 stated, reflecting on COIL's impact on the post-study role "I find myself always thinking of better ways of doing things, thinking of out-of-the-box thinking". These findings reinforce the work of Rubin and Guth (2023) and Swartz et al. (2021) who emphasise the importance of the COIL project process, timing, and syllabus for the promotion of self and peer-to-peer reflection, problem-solving, and improvement.

Reflections, lessons learned and enhancements

Reflections and lessons learned

Teaching Team Communication: the importance of communication across the teaching team was identified, such as ensuring that dates for meetings are noted and shared via Teams invites at the beginning of the project, so the teaching team can keep on track with meetings required to be undertaken, demonstrating the importance of structured processes within COIL.

Structured Student Communication: structure, relating to communication, must be built into class time to facilitate engagement, such as ensuring time in lectures/tutorials for in-country groups to work on tasks for the week and the teaching team explicitly seeking confirmation on where they are in the project cycle. This also includes office open hours for the students to engage in communication with the teaching team, where students could be guided on how to work meaningfully within their teams, or to answer any task-related queries.

Interaction and Engagement: provision of an environment of interaction and live engagement was deemed important, e.g. through hosting the teaching team from the partner institution to engage in the in-country class teaching, to provide a more intimate and live touchpoint with the other teaching members' part of the project.

Future enhancements

The team intend to adopt these enhancements over the next iterations of COIL:

Moderated Live Team Introductions: building further on the importance of structured student communication, an approach that could be adopted is providing an initial meeting for the whole group, via MS Teams, where they meet with their group members, with cameras on to emulate an in-person environment and to facilitate group cohesion, to break down some of the group-forming barriers that may exist.

Creative Thinking Exercises: Enhanced creative thinking exercises, with a suggestion this could be less serious to allow creativity in a less restrictive manner, where students are tasked with creating e.g. a superhero to overcome a societal problem, with a recognition that the process of doing something that is considered 'childish' can allow for encouragement of creativity due to the absence of strict boundaries.

Live Joint Presentations: Allowing for a more cohesive approach to be adopted by the group, live joint presentations can engage the group at a deeper level through shared practice of the narrative, but also facilitate more buy-in as they all must express their understanding of the shared project in a live environment. However, this also comes with a caveat recognising the complexities involved in such a large-scale project.

Conclusions

This study has added to the growing body of literature around COIL (Rubin & Guth, 2023; Swartz et al., 2021), and specifically its influence on the entrepreneurial mindset (Royle, 2023). The study highlighted that the students' interdisciplinarity was a key factor in the ideas generated, demonstrating far more creative outputs via their COIL collaboration than in other, similar but domain-specific group projects, thus building on the work of Gardner (2009) and Lin (2011). The groups' composition, whilst influential, did not exert the same significance on the students' own or the staff's perception of their creativity, rather it was the mix of unique, domain-specific knowledge and practices that the interdisciplinary teams brought to the project that had the greatest impact on their creative outputs. The process of COILs needs to be well-managed to remove as many barriers towards collaboration as possible, such as ensuring a shared platform and common objectives and approaches to the nature of the project (Rubin & Guth, 2023; Swartz et al., 2020) while simultaneously accepting the challenges of the *real-world* and preparing students for these challenges in their future careers (Crawford, 2021; Swartz et al., 2021). The benefits of COIL go beyond that of students' creativity, and whilst not the focus of the study, staff clearly highlighted the positive impacts on their own practice.

Despite the study's small sample size, the research team have experience collectively of numerous other COILs and have encountered many of the same challenges and successes; they believe it is clear that the growing trend towards interdisciplinarity in further and higher education is having a positive impact on collaborative creativity. This study demonstrates that by working together collaboratively, across different disciplines, cultures and educational backgrounds students not only learn critical meta-skills such as teamwork and professionalism (Bremner et al., 2024; Crawford, 2021) but that by expanding their horizons beyond their own domain-specific knowledge they are better prepared for employment post-graduation. With the findings suggesting that interdisciplinarity had the *greatest* impact on students' creativity, this research suggests that whilst COILs are inherently of value in a broader sense, with the obvious benefits of

internationalisation, cross-cultural communication and teamwork (Swartz et al., 2020), interdisciplinarity *itself* is often an overlooked, but critical feature which can be addressed within institutions at a local level and accordingly, should be sought out and encouraged proactively by all educators.

Biographies

Dr Elliot Pirie is an Associate Dean within the School of Computing and Engineering at Robert Gordon University. His research interests are in pedagogy, digital marketing, and consumer psychology, and he is a Senior Fellow of the Higher Education Academy in the UK.
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