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Promoting interdisciplinarity through an intensive entrepreneurship education post-graduate workshop

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Abstract

Purpose – While creativity and innovation are found within many disciplines, the opportunity to develop a tangible skill set and share ideas with contemporaries can be limited within the siloed structure of many tertiary institutions. The purpose of this paper is to evaluate a model that addresses the pedagogical challenge of interdisciplinary learning.

Design/methodology/approach – This paper adopts a case-based approach. The case subject is Aalborg University that founded an intensive entrepreneurial education workshop that incorporates a problem-based learning (PBL) approach. This paper evaluates the program design, development, and replication plus compares the motives and subsequent experiences between workshop participants in Denmark and Australia.

Findings – The findings of this case study validate the centrality of entrepreneurship education as a discipline which has the capacity to unite staff and students approaching problems from various fields. The workshop design was adapted to the changing needs and expectations of staff and students and was successfully replicated overseas.

Originality/value – Denmark established an innovative, intensive workshop which seized the opportunity to deliver an engaging program that unlocks untapped creative potential among students from diverse cultures and multiple disciplines. Overall, this research contributes toward the body of knowledge examining student engagement and the delivery of PBL activities within an interdisciplinary learning environment.

Keywords Entrepreneurship education, Problem-based learning, Interdisciplinary education, Real-world problem solving

Paper type Case study

Introduction

The design of meaningful, unique programs that enhances students’ experiences, combines discipline strengths, and creates tangible solutions to real-world problems is a complex challenge for higher education staff. Several learning models identify the need to combine experiences and viewpoints of students with new skills and knowledge taught by higher education institutions to create solutions for external clients. Practice-based learning, work-based learning, community service learning and Problem-based learning (PBL) all present tangible approaches that can address such variables (Ellenbogen, 2017; Hynes et al., 2010; Savery, 2015). The models share a commonality to the PBL definition

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provided by Savery (2015, p. 5) who stated that PBL is a “learner-centred approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem.” Ultimately, such models help connect students, universities, and clients and benefit each stakeholder through melding knowledge and experiences. The potential is further enhanced by encouraging interdisciplinary collaboration (Wall et al., 2017), however, Stentoft (2017) reflected on the challenge of uniting separate disciplines, noting the difficulties associated when navigating boundaries. The impacts are felt by students as learners and staff attempting to extend themselves beyond their field of expertise (Stentoft, 2017).

One discipline area that recognizes the opportunity to blend such an agenda is entrepreneurship education (EE). Through Kuratko’s definition of entrepreneurship, we can explore the foundations of EE. He stated that entrepreneurship “requires an application of energy and passion towards the creation and implementation of new ideas and creative solutions [...] [and ultimately] recognize opportunity where others see chaos, contradiction, and confusion” (Kuratko, 2014, p. 5). Entrepreneurial ideas emerge as we seek to find solutions in dynamic environments and there is arguably great potential in shared disciplinary knowledge, pooling diverse skill sets, and approaching problems through different perspectives. The focus of this paper is to examine the role of entrepreneurial education in bridging the discipline boundaries to design a successful PBL program. By investigating a specific case, this research examines the interrelationship between PBL, interdisciplinary learning, and EE.

The case under investigation is “Workshop for Innovation and Entrepreneurship” (WOFIE); a model/program operating since 2008. The longevity of WOFIE presents a unique opportunity to examine the changing landscape such programs face within higher education. This paper addresses several challenges and insights by examining the program design, operational experiences in both Denmark and Australia, and experiences of participating students.

Applying a PBL model to EE
Situated predominantly in business faculties, EE has experienced a siloed existence. The delivery of EE, outside of the constraints of a business faculty, can extend its reach and create the potential for interdisciplinary outcomes. The untapped potential of students with skills in creativity and innovation is found across all disciplines yet the opportunity to expose such talent can be missed for a variety of reasons. A PBL model provides a mechanism to nurture entrepreneurial skills among tertiary students and combine the perspectives and knowledge they bring from their primary field of study. An interdisciplinary approach can strengthen PBL, because multiple perspectives questioning the problem are inherent in an interdisciplinary approach. Furthermore, innovation is a core area of the WOFIE workshop, and innovation is about combining, prioritizing, and selecting multiple perspectives on the innovative case, which is also strengthened by an interdisciplinary approach (Rosenstand, 2012). Utilizing PBL within EE has the potential to create purposeful innovation whilst developing valuable graduate attributes recognized by universities and their associated labor markets globally.

WOFIE inception
The need to create a workshop by Aalborg University that nurtured entrepreneurial talent arose from a noted skill shortage in Denmark. According to the Danish think-tank DEA (2014), 9,000 new jobs are needed in Denmark every year until 2030. The development of entrepreneurial skills among graduates would help address this need. It was suggested that universities should do more to bridge between education and job market (Dansk Magisterforening, 2014). Not only a Danish phenomenon, this is applied to
Europe and beyond (European Commission, 2013). Since 2002, the Danish Government's innovation strategy proposed that investment in the educational system should contribute to an increase in the innovation capacity (Moberg, 2014). The current focus considers how entrepreneurial skills can be further expanded and anchored in all disciplines. Meanwhile, a backdrop of wider political initiatives, e.g. at the European Union and OECD levels (OECD, 2014), has promoted the expectation that universities will be entrepreneurial (Knowledge Economy Network, 2014). The European Union with the OECD developed a self-assessment tool for universities to evaluate the extent to which they are effectively entrepreneurial; one indicator is the extent to which the institution has incorporated “Entrepreneurship development in teaching and learning” in all departments (OECD, 2012, pp. 8-9).

There has also been a substantial increase of interest by the universities themselves over the last two to three decades to spur entrepreneurial action, encourage spin-offs, support Technology Transfer Office activities, and engage in joint ventures with external partners (Write et al., 2007, pp. 34-36). According to several studies collected and issued by Write et al. (2007), major drivers of these activities in European (selected key countries) universities have been the need for exploiting research in order to compensate for decreasing public funding, the adoption of a Bayh-Dole type of act to handle university’s intellectual property (effective January 2000 in Denmark), and a public debate of the role of universities in the society (Write et al., 2007, p. 1). As a result, this instigated pressure to commercialize research and inventions and an incentive to become “more applied” in its research. This, the authors have also observed, has increased the internal interest of their home universities to build entrepreneurial competences amongst students and staff including emerging entrepreneurship workshops (the focus of this paper), compulsory short-courses, and PhD courses in entrepreneurship and innovation.

The call for entrepreneurial higher education presents a way for universities to keep abreast of fundamental changes in knowledge production, such as new ways of creating knowledge and “borderless education,” together challenging the values and organization of universities (European Commission, 2013, p. 4). EE involving various disciplines incorporates a broader perspective than that traditionally offered by business schools which focus on “the business context of new venturing and enterprise growth” (European Commission, 2013).

Discipline areas do not approach EE in the same manner yet there are common definitions that position the desired outcomes. As cited by Moberg (2014, p. 16), entrepreneurship can be defined as:

The creation of new enterprise (Low and MacMillan, 1988); the creation and emergence of new organizations (Gartner, 1988); the process by which individuals – either on their own or inside organizations – pursue opportunities without regard to the resources they currently control (Stevenson and Jarillo, 1990); alertness to new opportunities (Kirzner, 1973); identification, evaluation and exploitation of opportunities (Shane and Venkataraman, 2000); judgmental decision-making under uncertainty (Foss and Klein, 2012; Knight, 1921); and the creation of new economic activity (Davidsson and Wiklund, 2001).

This paper adopts a broad understanding of entrepreneurship as the transformation of new opportunities to economic, cultural, or social value for others and examines how such values can be articulated through EE.

Developing the entrepreneurial skillset

Provision of EE opportunities for students of all disciplines provides many societal, organizational, and personal benefits. From a societal level, it is argued that enhanced skills can lead to the creation of more jobs resulting in economic growth and prosperity. Established organizations benefit through differentiation and renewal. Students fulfill a
desire for achievement and independence (Shane et al., 2003; Naffziger et al., 1994). A list of skills that students can potentially attain have been compiled by Moberg (2014, p. 8) including self-monitoring, self-motivation, creativity, pro-activeness, and sense of initiative. Education providers are attempting to meet the needs of the labor market by preparing graduates with non-cognitive entrepreneurial skillsets, regardless of their discipline (Moberg, 2014, p. 8).

Settings for the development of this entrepreneurial skillset can be isolated to business faculties, yet there is much greater scope to leverage a range of other perspectives and knowledge bases. EE provides a flexible discipline that thrives by compounding diverse fields. This interplay of knowledge results in interdisciplinary learning as disciplinarians work to integrate their perspectives and “construct new perspectives on a particular problem or scenario” (Stentoft, 2017, p. 53). One complexity in offering an initiative that attracts students and staff from multiple disciplines is how this is acknowledged within the higher education setting. If offered as an extracurricular activity, whereby participation does not result in credit toward a course but the student experience is enriched through engagement in an organized voluntary activity (Thompson et al., 2013), there are fewer bureaucratic hurdles. However, marketing, funding, and staffing voluntary activities that seek to attract discipline and cultural diversity remain large obstacles. Through program design, WOFIE attempted to accommodate and adapt to this set of complex challenges; such design elements will be explored in this paper.

The teaching and evaluation challenge
In discussions of teaching practices, codifiable/cognitive knowledge (e.g. science) is generally considered easier or less problematic to teach as compared to the more tacit/non-cognitive skills (e.g. art), which must be learnt through practical experience (Schön, 1983). The same is true for examination and grading of the two types of knowledge. Following this, EE poses a challenge to educational systems mainly designed for implicit knowledge that can be codified, since the challenge has not stopped policy makers and politicians from emphasizing the importance of incorporating entrepreneurship teaching to increase the students’ willingness to pursue a career as self-employed. Although far from resolved, it will be fair to mention that attempts have been made to move the field from craft to science (Sarasvathy, 2001; Sarasvathy and Venkataraman, 2009). While demand may exist to enhance entrepreneurial skills among students from multiple disciplines, the mechanism to do so is still problematic. The inclusion of new courses meets bureaucratic obstacles and competes in an increasingly competitive and changing tertiary sector.

The organization of universities is typically based on a medieval organizational model with faculties, departments, and studies. Furthermore, management is typically highly tactical, where the managers and employees of each silo are measured on their ability to meet the goals of their own organizational unit. There is very seldom strategic measurement regarding the ability to contribute to the complete performance of the university across faculties, departments, or studies. Thus, it is organizational contra intuitive to start initiatives on innovation and entrepreneurship across the silos, and it can only be done successfully and sustainably through the support of upper layers of management. When reflecting on initiatives that strengthen interactions between higher education institutions and external stakeholders, Hynes et al. (2010) suggested the need for a paradigm shift. Such programs should have the long-term vision to adapt to changing real-world needs, and educational institutions need to provide secure structures to facilitate future interactions (Hynes et al., 2010). Of course, it is possible for an enthusiastic team of individuals to implement a “bottom-up approach,” but to sustain and grow such an initiative, support of strategic management is required. Institutions need to offer support, funding, time, recognition and reward (Davies and Devlin, 2007, p. 7) if interdisciplinary offerings are to
develop and succeed. A collective approach is required to facilitate student-centric outcomes that also meet management expectations. Of course, there are exceptions, and it is only because of some visionary managers, an initiative such as WOFIE has been achievable and sustainable.

**WOFIE – the design**

The WOFIE program has been an initiative of Aalborg University, Denmark, since 2008. The program was facilitated as an intensive workshop, based on Aalborg University pioneering the PBL educational method, which provided a special framework of principles, such as problem orientation, interdisciplinary, exemplarity, participant direction and group work (Hansen et al., 2006; Kolmos, 2003; Kolmos et al., 2004). WOFIE had a local predecessor, the 2006 Multidisciplinary Innovation and Entrepreneurship workshop (MINE). MINE was a two-day intensive workshop that encouraged students to be innovative by addressing an issue with the opportunity of winning an award. Such initiatives followed the Denmark Government’s call to offer innovation and entrepreneurship to all students (European Commission, 2013; Moberg, 2014), although there was no dedicated external funding of MINE or WOFIE when these initiatives began.

The group that directed and implemented WOFIE represented multiple disciplines and departments. The WOFIE steering committee (later changed to a coordination group) had representatives from four faculties and the university library. Administrative and project management support was additionally provided. Collectively, the holistic team was responsible for marketing the program, gaining sponsorship, technical support, pedagogical development and guidance, and execution (Rosenstand and Tribler, 2012). The basic organizing principles remained but became leaner in subsequent program offerings.

Postgraduate students from all disciplines were encouraged to participate; the majority of students were master students in their first year. Participation was also offered to some upcoming master students, PhD students, alumni and employees. The participants worked in interdisciplinary groups of five to six participants and had access to supervisory staff throughout the workshop. To ensure that a diverse array of people could participate, the workshop was facilitated on multiple locations (distant campuses); simultaneously (and later occasionally) connected through video conferencing. The workshop language was English, which allowed multi-cultural inclusion. Moreover, partners such as University of Southern Denmark, Roskilde University, University College Northern Jutland, and University College South Denmark have been sending students to WOFIE over the years (Rosenstand and Tribler, 2012).

Students were mixed across disciplines, faculties, and institutions. A multi-campus videoconference was used for shared instructions, inspiring talks, the competition finale, and the small prize ceremony, which supported the experience of a joint workshop. Business and information experts were located on the site ready to facilitate the student groups and from 2012, Facebook was used as a communication platform to further facilitate industry involvement (Rosenstand and Tribler, 2012).

**Navigating the process**

The WOFIE program extended over four days and the students committed to an intensive work-program over the consecutive days. The primary foci of the first two days of WOFIE were as follows: idea generation, exploration of needs, finding value proposition, and verification. The main foci of the last two days were as follows: building a business concept and developing and delivering a convincing presentation. Creativity, innovation, and business development were the core areas addressed. The learning objectives broadly surrounded “innovation and entrepreneurship issues” and the evaluation criteria included “newness” and “business potential.” Part of the evaluation criteria therefore addresses the
ability to communicate and “sell the idea” of a business including the value creation proposal. The business part was bifocal and could be either the group themselves acting as entrepreneurs proposing it to an investor (being the initiators of a business), or it could be a business concept and a plan proposed to a company/institution.

A “Guide Map” was developed in a pedagogical formation by member of the WOFIE Steering Committee (including two of the authors of this paper). The implementation of each iteration of WOFIE resulted in the structure featured in Table I. This refinement process created four categories, each covering the activities for across four days. The “Guide Map” was presented as a four by four interactive matrix, with 16 methods, on a website dedicated to WOFIE (replicated in Table I). It was designed in a recursive way so that the same progression steps used to label each of the four days of the workshop were also used to label the progression of activities carried out each day. The progression steps were:

- “Uniqify” (Day 1).
- “Verify” (Day 2).
- “Businessfy” (Day 3).
- “Convincify” (Day 4).

This denoted the overall innovation/entrepreneurship progression during the workshop. For simplicity, the same labels were recursively used to describe the progression of activities carried out each day. Thus, tools and examples were offered for each of the 16 methods by clicking the activities in the “Guide Map” matrix on the webpage. This facilitated four main purposes: defining/finding what is new (Uniqify), validating information and assumptions (Verify), considerations about commercialization (Businessfy) and preparing how to clearly communicate the results achieved (Convincify).

Because of the unpredictable and iterative nature of a development process, this matrix was offered as a flexible “toolbox,” not a strict mandatory sequential process. It allowed for navigation between the four aspects each day as the students and supervisor sees fit, while also allowing for iteration; going back to activities from previous days, for example, if a group felt their progress was stalled, they could revisit or revise a key step (Tollestrup, 2011).

At the conclusion of the fourth day, the student teams presented their idea to a panel of judges (a jury) composed of both external representatives and university employees. The jury evaluated the individual presentations based on several criteria: innovation, feasibility, market potential, and pitch presentation. In the initial WOFIE format, the jury evaluated the coherence with the theme; however, this changed to a supervisor responsibility and task. The final day concluded with a small ceremony, where first, second and third place in the competition for the best business concept were announced. Winning teams were rewarded with cash and other prizes. The winners received a portion of the money prize; approximately 4,000 euro. Peer evaluation was also embedded within the program and the winners, as voted by students, received tickets to a music festival.

<table>
<thead>
<tr>
<th>Table I. Activity matrix simplified without specific methods</th>
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<tr>
<td>Activities</td>
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<tr>
<td>Uniqify</td>
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<td>Verify</td>
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<td>Businessfy</td>
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<td>Convincify</td>
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The importance of a central theme

An important consideration when integrating disciplines is the theme upon which the program is based. The inaugural WOFIE saw students select the themes they sought to tackle. In 2008, the first WOFIE (and the precursor "MINE" workshop) did not have a specific theme. Initially, the focus was to build the skills set among students so they could apply their heightened creativity and innovation techniques to help them develop their business ideas to develop an innovative solution for a problem of their own choice. It was assumed that this would increase ownership and motivation. However, it became clear that the students spent too much time on choosing a theme, and in addition, multiple themes made it more difficult to compare and judge the resulting business presentations in the final competition.

As WOFIE evolved, greater importance was placed on a unifying theme. Involvement in real-world problems, with emphasis on grand challenges, for example, sustainability issues, allows universities to connect with communities whilst offering students the opportunity to develop and exhibit citizenship responsibility (Gibson et al., 2011; Klink and Athaide, 2004; Millican and Bourner, 2011). By working on problems that may ultimately result in the creation of social or environmental value, students can be rewarded through intrinsic value. From a social sustainability perspective, students participating in community-based initiatives, where they actively address areas of societal concern, are “better prepared to be concerned, active and involved citizens when they graduate” (Millican and Bourner, 2011, p. 90). While addressing real-world issues of social significance, there is evidence to suggest that combining discipline specific strengths is necessary (Davies and Devlin, 2007; Schlee et al., 2009). Furthermore, Wall et al. (2017, p. 221) noted the urgent call for “higher education to do more to embed sustainable development in the curricula.” By providing a thematic event, students from multiple disciplines were given an opportunity to share knowledge and resources thus creating a rich and diverse learning environment.

Realizing the inherent importance of a thematic approach, and the value in addressing issues of social significance, WOFIE 2009 adopted a theme closely aligned to sustainability. Sustainability, as a central theme for interdisciplinary learning, holds several advantageous particularly as it draws in the potential to encapsulate the multi-disciplinary skills and knowledge harbored within each discipline. This ensured that students from multiple disciplines and diverse cultures would be able to contribute aspects of their particular discipline, but also helped establish a purposeful agenda. Subsequent iterations of WOFIE capitalized on the unmet need to address real-world problems – often formulated as a grand challenge. The success of the thematic approach was further enhanced by the inclusion of challenges offered by non-government organizations or non-profit organizations (NPOs), which took account of real-world problems.

The value of a grand challenge theme (sustainability) has also been observed in countries that have trialed the WOFIE model. Shared intellectual property by Alborg University of their WOFIE program created an opportunity for an Australian tertiary institution to replicate the program. Australian adaptation of the WOFIE model commenced in 2011; they incorporated the most up-to-date, best practice findings shared from Aalborg WOFIE.

The Australian institution adopted the thematic approach. Seeking to build on the importance of real-life problems, they solicited challenges from private organizations and NPOs that addressed the theme of sustainability. The sustainability theme was purposefully selected as one that would unite disciplines and allow the pooling of skills and experience regardless of a participating student’s knowledge or cultural background.

Measuring the changing perceptions of WOFIE

Participants were invited to evaluate the effectiveness of WOFIE after the workshop. The online survey revealed information about the learning process and the skills participants gained.
from the experience. This research considers the Aalborg University data collected between 2008 and 2014. Adopting similar evaluation tactics, the Australian institution evaluated student experiences with data from 2012 to 2013. Survey questions primarily containing open responses, sought to ascertain the main reasons for participation and the value they gained from being part of the workshop. The richness of the qualitative data emphasized the positive and negative aspects of this program. Researchers ensured that the questions were comparable in both Denmark and Australia and all participants completed the online survey anonymously.

It was also important to consider the views of the steering committee and the subsequent adaptations they made to the WOFIE workshop over time. As such, a narrative examining the challenges and opportunities experienced by creators of this innovative and evolving workshop was evaluated.

As shown in Table II, the number of participants for the Denmark WOFIE was considerably higher than those in Australia. Key reasons for the smaller number of participants in Australia relate to the capping of numbers to run WOFIE as a pilot program. Although the numbers remained small in the two subsequent years, the participants represented a range of discipline areas as per those in Denmark. Overall, the WOFIE program generated great interest among students from a range of disciplines whilst being offered in Australia and Denmark. In addition, the WOFIE workshops in both Denmark and Australia attracted participants from a range of cultural backgrounds involving a high proportion of international students. As such, a comparison of cultural differences between the two locations where WOFIE was offered was not discernible.

**WOFIE participation: incentives and skill development**

Participants from Denmark (DEN) and Australia (AUS) reflected on why they sought to become involved in the program and what they had gained from the WOFIE experience. The feedback provided by participants has been divided into incentives that encouraged their involvement and skills they developed from WOFIE.

**Incentives**

There were four key incentives for involvement:

1. developing knowledge and understanding of innovation and entrepreneurship;
2. the opportunity to work on a real-world problem;
3. course credit; and
4. prize money.

**Developing knowledge and understanding of innovation and entrepreneurship.** Denmark and Australian organizers used various incentives to attract participants; key attributes, from the perspective of the students, were their desire to enhance their knowledge, understanding and application of innovation and entrepreneurship. Many students participating in the event came from different cultures and disciplines, and WOFIE provided an opportunity to apply their discipline knowledge while learning new skills and developing their understanding.
Regardless of their primary discipline, students saw value in the WOFIE program to develop and broaden their knowledge and skills; thus, reinforcing the role EE performs in bridging disciplinary boundaries.

The opportunity to work on a real-world problem. The interconnectedness between PBL, interdisciplinary learning, and EE became prominent as students identified why they chose to become involved in WOFIE. For most WOFIE participants, the opportunity to solve a real-world problem for a real client was a core consideration when choosing to participate in WOFIE in both Denmark and Australia:

Wofie simulated a real work environment, where everything does not have to be documented in an academic way, but in a way that makes sense business and innovation wise (DEN, 2014).

I enjoyed that we were challenged with “real-life” problems and we actually made a product by the end of the WOFIE (DEN, 2014).

The students valued the opportunity to “give back” and help or solve problems for a NPO. Reflective statements illustrate such views:

Learning about the different aspects of applying innovative ideas to the real world. Learning new tools. Really being able to help a NFP organisation [NPO] (AUS, 2012).

The opportunity to tackle a real problem that the NFP [NPO] client has and come up with solutions that they could implement (AUS, 2013).

The Australian participants placed more emphasis on the sustainability theme compared to Denmark participants, but importantly, it was the “real-world” application that appealed to both sets of participants. The importance placed on this incentive for participation reinforces the value other authors have attributed to interdisciplinary collaboration and the potential for solving complex problems (Davies and Devlin, 2007; Schlee et al., 2009; Stentoft, 2017; Wall et al., 2017).

The Australian challenge providers (clients) were present at selected times of the workshop to reiterate the nature of their challenge and allowed for interaction with the students. This became an important element to the workshop as it generated greater team cohesiveness as they sought to create a solution on behalf of their new client. A race to a competitive outcome ensued and added to the dynamism of the learning environment. Further adding to the value placed on the student’s solutions, Australian challenge providers were present at the judging. The 2012 and 2013 Australian WOFIE workshop continued with client-focused challenges and further emerged into a workshop that emphasized social innovation and entrepreneurship. Post the inaugural event, the value in helping the non-profit sector find solutions to their challenges set the pathway for the 2012 and 2013 events.

Course credit. The original concept of WOFIE encouraged students to participate in the initiative in a voluntary capacity. The WOFIE initiative in Australia was run for three years. Participants evaluations indicated that WOFIE enrollment could improve if the added incentive of course credit was offered. Responding to this feedback, the introduction of course credit sought to appeal to a broader array of students that potentially carried different motives for participation. Although course credit was available in 2013, the majority of students participated in a voluntary capacity exemplifying the importance of the real-world application and opportunity to enhance their understanding of innovation and entrepreneurship. In Denmark, the added incentive of credit toward their university transcript and a diploma was an additional incentive but students expressed similar views to those in Australia.

Prize money. One incentive considered of least importance for participation in the WOFIE experience was the provision of prize money. Prize money was available for winners of the
The WOFIE challenge in both Australia and Denmark. In Australia, it was featured as an incentive to participate, yet in Denmark the students only learned of the prize money once they began the challenge. Although prize money was available, the Australian participants did not consider this as an important reason for participation. Denmark participants confirmed that prize money was not significant.

**Skill development**

Involvement in the WOFIE initiative encouraged the development of various skills, however, when asked what students gained from involvement, teamwork and enhancing critical problem-based thinking were the core skills perceived to be enhanced or developed through participation in WOFIE from students in both countries.

*Teamwork.* The core skill discussed by participants was that of “teamwork” (the notion “team” was used, but in fact “group” might better reflect this type of social unit). For students in both countries, the main outcome of the program was a development of their skills in teamwork. When asked what the most positive aspects were about being involved in WOFIE, statements supported the top-ranking skills but importantly, students appreciated the opportunity to work with people from other disciplines and nationalities to solve real-world problems. Denmark participants responded to the opportunity to work with people of varying disciplines and differing nationalities:

- Fun meeting new people with other knowledge and background than your own (DEN, 2008).
- I have gained valuable real-life experience and it was a pleasure to work in such a [varied] team (DEN, 2014).
- The business point of view (from people, who are more involved in business disciplines) helped me to understand better feasibility of developed concept. We also discussed differences regarding certain everyday life issues between Danish and other cultures - I perceive it as good for deeper understanding of problems (DEN, 2014).
- It was interesting because each of us was giving examples of its country and how issues like this (such as our issue) could be developed, resolved, etc. in our homelands (DEN, 2014).

Overall, there was emphasis placed on how challenging it was to work with people of different cultures and backgrounds, however, this fostered a sense of respect, and enhanced innovation.

In comparison, Australian participants had a high degree of cultural diversity among their participant across the three years. Representative comments from Australian WOFIE students include:

- Working with an exciting group of people to provide solutions to a real-life problem (AUS, 2012).
- Working together to try to resolve a real problem and meeting the challenge providers and seeing how passionate and energetic they are and seeing how they are able to help others (AUS, 2012).

Although teamwork was considered a major area of development, it was also considered a challenge. Inherent in teamwork are the difficulties of language barriers and clashing personalities, as such, team composition was the main point discussed in relation to negative experiences. WOFIE students acknowledged the challenges of working across disciplines and nationalities within a small window of time. A representative statement highlighting this challenge – “Working in a high-pressure context with people I didn’t know - from different cultures and knowledge bases” (AUS, 2012). A similar sentiment was expressed from Denmark participants, for example, “It was a big challenge because of our different background and knowledge” (DEN 2014). With teamwork being the strongest skill developed, this challenge appears to have been something they learnt most from. Several students from
both Denmark and Australia acknowledged the benefits of being challenged in this way. A representative comment drawn from a 2008 participant expresses this sentiment:

[...] Sometimes it was very difficult because of the difference in ways of thinking, but it was at the same time challenging. I liked the challenge and the idea of working interdisciplinary (DEN, 2008).

Similarly, WOFIE staff navigated great challenges when combining multi-disciplinary and multi-cultural groups. One staff member identified that it was important to begin the workshop by focusing “on the differences regarding the disciplines” and allowing students to “develop common language” as they progressed (DEN, 2014).

New knowledge and critical thinking. The real-life problems had to be solved in a time-constrained environment. Students had to rapidly adjust to language and cultural barriers, the variation in discipline knowledge, and work in teams that inevitably encompassed variations in opinion and dominant personalities. Overall, the teams had to challenge each other’s ideas, make compromises and justify their final decisions in order to make a convincing delivery before the judging panel. Many embraced this opportunity to learn and apply new knowledge and ultimately develop critical thinking skills. The intensive nature of the workshop did test patience and placed pressure to make fast-paced decisions. This inevitably led to some negative criticisms or inhibitors of this type of workshop. The same factors that nurtured the challenge many participants enjoyed were also the named inhibitors of this style of learning: time limitations, team dynamics, and language barriers.

Staff perceptions and adaptations of WOFIE

A range of other administrative challenges forced the steering committee to make changes. Reduced funding/financial support resulted in reduced IT support that enables live cross-campus linkage. In a time when improved online offerings are encouraged, such as MOOCs and distance learning, skill technicians are required to help run continuous live feeds such as those that enable WOFIE to be a cross-campus workshop. Technology was considered a “challenge in coordination across sites” (DEN, 2014) and needs to work impeccably particularly when communicating live to other venues, “remember to talk only to all locations when it is relevant for all locations, be overly service minded for the other locations – they lack critical mass and the joint feeling of big activity and buzzing” (DEN, 2014).

Over the years, the number of WOFIE facilitators reduced in Denmark. One observation was that the program would benefit from a renewal of the coordination team to generate new ideas (DEN 2014). This may encourage a revitalized WOFIE and enable the program to compete with new, yet similar, competitive workshops or programs that occur (DEN, 2014). As such, “competition in attracting students to exciting events” became an important issue for the steering committee and there was a need for improved marketing of the learning outcomes and quality (DEN, 2014).

Similar to the administrative factors mentioned above, the Australian WOFIE program also had to contend with the competitive environment of extracurricular offerings, and the need to diversify the WOFIE program. Similar adaptations were made including embedding the program into course offerings for credit, and importantly, shifting the focus of the challenges toward a pro-bono model; addressing challenges (real-world problems) submitted by NPOs. This reduced the opportunity for the program to acquire external investment, i.e. through sponsorship of paying clients. This aside, the program benefited in altruistic ways by demonstrating its worth through the creation of social and environmental values. Tangible and intangible values were generated through this win-win-win scenario. Students, NPOs and members of the steering committee, all expressed a significant importance of this variable.

From a facilitator’s perspective, engaging students without any business knowledge had some advantages for the teamwork element. It allowed a more nuanced discussion on value
creation and broadened the scope beyond financial profit. It also aligned with successful companies and entrepreneurs whose mission and purpose extends beyond financial profit. For example, an entrepreneur’s motivation is often associated with such general non-pecuniary motives as “need for achievement,” “locus of control,” “vision,” “desire for independence,” “passion,” “drive,” and “goal setting” and “self-efficacy” (Shane et al., 2003, p. 20).

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Implications of this study

The WOFIE concept had been practiced since 2008 when the Aalborg University first integrated a PBL approach in the design of this EE workshop. Over time, facilitators seized the opportunity to observe and collate participant feedback, evaluate, and adjust the workshop to meet the evolving needs and expectations of participating students, and adapt to the changing tertiary education landscape. The need for programs to adapt and evolve with the support from higher education institutions was noted by Hynes et al. (2010). This case contributes to the literature examining experiential and interdisciplinary learning programs and provides insights into design factors as well as facilitators and challenges of such programs.

Participants emphasized the opportunity to work on a real-world problem as a core factor in their decision to participate. Real-world problems are pivotal within PBL (Stentoft, 2017); this case sought to expand on this centrality by examining design elements that would attract students from different disciplines whilst drawing on their strengths. Through evidence drawn from this case, EE has proven to be a foci discipline that transcends boundaries thus contributing to the “borderless education” sought by the European Commission’s (2013) mandate. Delving deeper into the program design, WOFIE demonstrated the value and purpose of utilizing a central theme that would allow students to contribute and exchange knowledge based on their personal life experiences. Sustainability, as a theme, dissolved borders and tapped into a common language shared across disciplines. Additionally, sustainability problems allow students to create environmental and/or social values, thus providing participants with another reason to assign their time as their input supports a worthwhile cause. This supports Davies and Devlin’s (2007) and Schlee et al.’s (2009) discussion on how real-world problems of common concern are the ideal focus for interdisciplinary solutions.

The altruistic value of a program such as WOFIE is an important factor but one that cannot necessarily be sustained. Program design adapted to changing tertiary environment and responded to the changing expectations of students. Such changes included embedding WOFIE participation into individual courses and offering course credit. This became a mechanism to improve and sustain participation numbers and legitimized the effort in the university governance system. By incorporating WOFIE into mainstream offerings, this was a way to create synergy between the discipline strengths of the WOFIE team and their other course commitments thus creating resource efficiency. One recommendation was to “engage faculty in the development and get the course written into the study regulations of appropriate programmes” (DEN, 2014), which essentially diverted the original concept of an extra-curricular workshop toward an embedded, for-credit content within an individual course. This shift occurred in the Australian WOFIE too. It may be seen a “natural” development cycle for WOFIE; starting with a period of development, testing the concept and ultimately becoming part of the curriculum with an operational efficiency that can run from a regular resource base.

Finally, as administrative changes impacted WOFIE’s design and implementation, there was also a decline in interest from external partners supporting the workshop through sponsorship; perhaps due to the general global economic crisis. New ways of engaging external organizations in non-monetary ways were essential and linking to a social outcome became the key to this issue.
Conclusion
This paper has examined the trajectory of an EE program that encouraged an interdisciplinary approach to find solutions to complex problems. The WOFIE program provides a framework upon which other educational institutions can model and adapt such initiatives. This program effectively combined the skills and knowledge within the boundary of EE, allowing participants across different cultures to apply their own knowledge from their chosen discipline area. Ultimately, this practical framework provides an opportunity to combine disciplines, explore creativity and create innovative solutions toward real-life problems. The type of real-life problems undertaken, such as social and environmental sustainability, influences the student’s propensity to sign up and enjoy participation. Future research could investigate the longitudinal value as perceived by WOFIE alumni. Measures could include the transferable nature of EE when applied to the workplace and the role of such initiatives in nurturing global citizenship.

The WOFIE program was replicated in Denmark and Australia allowing for comparisons. A high proportion of similarities were reported allowing for findings related to incentives for participation, skill development and challenges experienced by staff. One of the main contributions of this comparative analysis between the Danish and Australian WOFIE workshops was the challenge to remain viable in an environment of reduced funding and support for extra-curricular activities within the tertiary sector. The flexibility offered through the WOFIE model can help educators achieve an innovative curriculum within a flexible budget.

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