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## Entrepreneurship education through sustainable value creation – exploring a project introducing circular economy

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### Abstract

Sustainability challenges expressed by The Sustainable Development Goals (SDGs) and transformation towards a more Circular Economy (CE) imply the needs for broad collaboration in innovation and entrepreneurship. CE is perceived by business suitable for contributing directly to achieving several of the SDGs. In entrepreneurship education (EE) a new educational approach is emerging towards problem-based learning (PBL) solving open-ended real-life issues. In this paper, a connection between sustainability, CE, and EE has been strengthened. We briefly explore an increased attention to sustainability and how CE overtime has been introduced in an educational setting where entrepreneurial learning and sustainable value creation can take place. The scope for investigation is a project with two courses at Western Norway University of Applied Sciences with partially common educational activities. Increased educational attention to sustainability arose in 2017-2018, during spring semester of 2019 a CE-test was conducted and fall 2019 CE were implemented and continued in 2020-2021. Engaging CE shows positive outcome, and the main findings are: (1) CE offer a common language and platform for real-life sustainability cases in EE; (2) CE- and sustainability-cases are demanding and call for simplification; and (3) Open-ended CE-cases imply need for external collaboration, and thus more structure. In summary the CE project suggests promising possibilities for experiential learning, sustainable value creation, and an opportunity for increased external orientation. A deeper understanding of CE is achieved. There is a need for further empirical examination.

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## 1. Introduction

Sustainability challenges expressed by The Sustainable Development Goals (SDGs) [1], and transformation towards Circular Economy (CE) imply the need for a broad collaboration in innovation and entrepreneurship. These two are important drivers for growth, productivity, and welfare development. Governments, companies, organizations, and academia has an increased focus on innovation and entrepreneurship. Entrepreneurship is a significant source for nation's economic growth and job creation [2-3]. One common definition of entrepreneurship is identifying and act upon opportunities and ideas and transforming them into value for others [4]. Intrapreneurship or corporate entrepreneurship is entrepreneurship inside an organization [5]. An entrepreneurial mindset can help to identify and take advantage of opportunities for value creation. Sustainable entrepreneurship is a newer term with a variety of definitions. Ref. [6] emphasize discovering, evaluating, and exploiting economic market failures. Cohen highlight in [7] discovering opportunities and creating new future goods and services with economic, psychological, social, and environmental consequences.

McDonough et al. describes an ambitious approach [8], to turn the industrial economy of 'take, make and waste' into a sustainable system of circular economy that generate ecological, social, and economic value. Value creation is defined in The Entrepreneurship Competence Framework as "...the outcome of human activity to transform purposeful ideas into action which generates value for someone other than oneself" [4], and the value created can be social, cultural, or economic. CE has gained momentum as an approach for achieving local, national, and global sustainability. The approach is for example evidently in the Circular Economy Action Plan [9]. In recent years sustainability- and CE-education has attracted increased attention, including as a subject of study in higher educational institutions.

In this paper, a connection between entrepreneurship education, sustainability and circular economy has been strengthened. Two theoretical positions have been selected: (1) Entrepreneurship education anchored in experiential- and problem-based learning (PBL) approaches aimed at developing entrepreneurial competence, and (2) Sustainability and circular economy. This is the third study that focus on experiential learning pedagogical issues with the central argument that teaching should be developed in a way that emphasizes sustainability and broad collaboration, aim at accelerating entrepreneurial competence and sustainable development [10-11]. We explore an increased attention to sustainability and how CE overtime has been introduced in an educational setting where entrepreneurial learning and sustainable value creation can take place. The scope is two entrepreneurship courses with several common activities at Western Norway University of Applied Sciences (HVL). These are probably the first two courses at HVL introducing circular economy to some extent. New courses and study programs have been developed inspired by these and will be offered for the first time in fall 2022. This paper target universities educational- and social responsibility-mission, by investigating an integrated sustainability action. The objective is to explore how universities also can contribute to solve the SDGs, through challenging student with sustainability issues and implementing CE.

*Entrepreneurship education (EE)* is considered an important contributor towards the aforementioned goals of economic growth, productivity, and job creation. In higher education, entrepreneurship can be defined as "... making students more creative, opportunity oriented, proactive, and innovative, adhering to a wide definition of entrepreneurship relevant to all walks in life" [4]. Furthermore, it involves identifying opportunity, business development, self-employment, venture creation, and growth, i.e., becoming an entrepreneur [12]. EE pedagogy in higher education stipulates three alternatives, which is the manner through entrepreneurship can be taught: teaching about entrepreneurship; teaching for entrepreneurship; or teaching through entrepreneurship [13].

*Experiential learning* has been regarded an important pedagogical approach, with more guidance and less traditional lecturing, resulting in a more active learning style. Several experiential concepts are based on the four stages in Kolb 1984 model: conceptualization; experimentation; experience; and reflection [14]. According to [15] experiential learning should replace traditional teaching, claiming EE must be more unconventional in both content, method selection and grading. A new paradigm comprising four approaches in respect to ways in which students can expand their insight and take an active ownership of their learning. In short, the paradigm embraces theory-based knowledge in practice to formulate and create innovative ideas and solutions, professors facilitating the co-participation of knowledge, introducing variety in experiential methods, and lean both "about", "for", and "through". A recent educational approach is emerging towards problem-based learning (PBL).

*Problem-based learning (PBL)* are a student-centered approach that aim at solving open-ended real-life problems like sustainability challenges rooted in the SDGs. By so doing, students can be exposed to the uncertainty and

ambiguity related to it and the challenge drives motivation and learning [14]. “Learning-by-creating-value” approach grounded in the field of entrepreneurship aim at equipping students with entrepreneurial competence, regardless of whether successful value creation is being attained or not by users, customers, or other stakeholders [16]. EntreComp, state of the art framework, recommend motivating students and teams by learning “through” value creation [4].

*Sustainability* challenges have been clearly expatiated for example in the Climate Change 2021 report from The Intergovernmental Panel on Climate Change [17]. The topic is being incorporated in the agendas of policymakers and the strategies of companies. The concept of sustainable development was popularized in 1987 by the Brundtland Commission. Ref. [18] discovers over three hundred definitions of sustainability, although [19] provide the most accepted definition of sustainable development as “*development that meets present needs without compromising the ability of future generations to satisfy their needs*”. The Sustainable Development Goals (SDGs) provide a common working platform to reach the goals for social, economic, and environmental development worldwide [1,20]. SDG 17 (Partnerships for the goals) promote extended collaboration to reach the goals.

*Circular economy* is regarded as a condition, a beneficial relation, or a trade-off for sustainability [21-22]. Circular economy is a recent concept that promotes efficient use of resources and is perceived as a practical tool and mindset suitable for contributing directly to achieving several of the 17 SDGs and the 169 SDG targets [22]. According to research by Schroeder et al. [22], the potential is most significant for SDG 6 (Clean water and sanitation), SDG7 (Affordable and clean energy), SDG 8 (Decent work and economic growth), SDG12 (Responsible consumption and production), and SDG 15 (Life and land). Furthermore, they argue that social sustainability so far has not been incorporated at the core of CE [22]. In line with the argument espoused by [23], CE can also be a beneficiary approach for human resources and the social dimension of business models.

We have highlighted three main elements of CE: (1) Defining CE; (2) Circular strategies; and (3) Important factors to facilitate a more CE. In addition, we also focus on the three main questions: “why”, “what” and “how” CE. The fifth Circular Gap Report deals with CE and its equitably to fulfil global needs with radically less waste, materials, and emissions [24]. The report states that the world is only 8,6% circular and helps to answer the “why CE” question.

*Defining CE*, answering the “what” question. There is not one generally accepted definition of CE and [25] investigate 114 different definitions. According to [26], CE is regarded as a paradigm shift from an industrial economy of “take, make and dispose” kind of system to a more sustainable economic system. Geissdoerfer [21], define CE as “*a regenerative system in which resource input and waste, emission, and energy leakage are minimized by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling*”.

*Circular strategies and important factors to facilitate more circularity*, answering the “how CE” question. The CE is directed by 3R framework, namely Reduce, Reuse, and Recycle, which are the major strategies for eco-friendly production. 3R is the most applied CE strategy, supplemented by 4R, 5R, 6R and the most nuanced 9R [25]. Ellen MacArthur Foundation (EMF) tries to capture the essence of the circular economy and helping us to understand and apply CE by the “butterfly diagram”. The following strategies are included: Repair, Reuse, Refurbish, and Recycle [27]. Four important factors are also outlined in [27]: circular design; innovative business models; core competencies along value chains and reverse cycles; and enablers to improve CE performance. Enablers are such as regulations, digitalization, education, and collaboration.

*Collaboration* is also heavily promoted in innovation - and entrepreneurship literature. External interactions are embraced and promoted under the term “open innovation” [28]. Collaboration between stakeholders is regarded as a prerequisite for sustainable development. In line with a CE Handbook, collaboration is viewed as an accelerator to reach the SDGs [29]. [23] highlight the value of alliances and collaboration to solo runs in contemporary sustainable circular business models. Furthermore, relational theory endorses an outward orientation to value creation, and argue that the source of competitive advantage to a large extent exists outside the company's boundaries which is accessed by e.g., knowledge-sharing routines, complementary resources, and competence [30]. Earlier research by March has identified two main perspectives for interaction and allocating resources [31]. The relation between exploration and exploitation are considered. The work argument that exploration is likely to be effective in the short run, and thus damaging in the long run.

## 2. Methodology

In this paper two theoretical positions have been selected: (1) Entrepreneurship education anchored in experiential- and problem-based learning (PBL) approaches, and (2) Sustainability and circular economy. We explore how CE has been implemented and can be designed and structured for an educational setting. This paper investigates two entrepreneurship courses over time introducing sustainability and CE at Western Norway University of Applied Sciences (HVL): ING101 Technology Management, Economics, and Innovation (ING101), and ØAA117 Practical project management and sustainable innovation. The two selected courses have partially common educational design and activities. The differences are related to focus, subjects, type, and number of students. The two professors responsible for the course are the same, and part of the semester common lectures and supervisions have been practiced. The two courses are further described in the subchapters 3.1 and 3.2. Table 1 make an overview of important dimensions of variations in the two entrepreneurship courses:

Table 1 Important dimensions of variations.

Dimension	ING101	ØAA117
Discipline	Engineering	Business Administration
ECTS	10	7.5
Students/year	500	100
First time given	Fall 2013	Fall 2019
Intro sustainability cases	Fall 2017	Fall 2019
Intro external case owner	Spring 2018	Fall 2019
Intro circular economy cases	Spring 2019	Fall 2019

This study is based on an “information-oriented approach” [32]. By this, we mean when the objective of the research is to obtain the greatest and most interesting type of information from a given phenomenon (in this regard, referring to sustainability and CE in the domain of EE). Our goal is not to generalize, but to achieve a deeper understanding of sustainability and CE in EE. Our data is primarily obtained from documents, meetings, notes, semester schedules, student’s semester assignments, information from learning management system (LMS), and evaluation of students and professors. A participatory involvement strategy is employed in this study, and its therefore not necessary that the authors should be “objective” observers of the phenomenon. We are aware of our role as participants rather than objective observers [32].

## 3. Case presentations and findings

We investigate two entrepreneurship courses at HVL with partially common educational activities, ING101 and ØAA117. In the period between 2017 and 2019 there were an increased attention to sustainability, and later CE were implemented in two EE courses. This is probably the first two courses at HVL, introducing CE to some extent. The main purpose of the two courses is to develop student’s entrepreneurial competence such as creativity, opportunity recognition, and business development skills in line with for example sustainable entrepreneurship [6-7]. The design of ING101 and ØAA117 are inspired by research-based EE pedagogy [13], experiential learning [14-15] and related styles founded upon Kolb’s Learning Cycle. This section is structured in four subchapters: (3.1) ING101 is briefly described; (3.2) ØAA117 is briefly described; (3.3) Sustainability and implementation of circular economy; and (3.4) Findings and results.

### 3.1. Course ING101 – briefly description

ING101 are structured into five modules. Figure 1 illustrate the structure of ING101, expressed by semester schedule structure.



Figure 1 Semester schedule for ING101. Source: Own work [11]

The professors function as facilitators and the students works in teams of 4-5 persons. The main learning activities for the engineering students is how to transform problem and demands into business ideas, present it as an “elevator pitch” in front of an external panel and finally write a realistic business plan. A demanding semester assignment, the business plan, is one of the main learning areas where the teams employ theory in practice to solve open-ended problems rooted in real-life challenges, to develop entrepreneurial competence [15].

### 3.2. Course ØAA117 – briefly description

ØAA117, in its redesigned version, was for the first time given in the fall semester 2019 (ref. Table 1). ØAA117 is a 7,5-ECTS course for Business Administration students at HVL in the bachelor program. ØAA117 follows the structure of ING101 (ref. Fig.1), but due to 2,5 less credits, the scope of Modul 3 is reduced. Project management is an important topic given the importance of tools and teamwork, and Modul 4 is for this course labelled “Project Management”. Figure 2 illustrate the structure of ØAA117.



Figure 2 Semester schedule for ØAA117. Source: Own work [11]

A smaller project and a demanding semester assignment are two of the main areas of learning where groups use theory in practice. Fall 2019 more than 70% of the lectures and supervision was common for ING101 and ØAA117, providing opportunities such as: (1) common real-life cases supervision, and presentations; and (2) multidisciplinary approach [14].

### 3.3 Sustainability and implementation of circular economy - description

Here follows a brief timeline describing increased interest in sustainability and the process over time leading to CE application from 2019 onwards. Since fall semester 2013, when the ING101 course was introduced, the idea-development process had been based on “real-world” problems emanating from the students. The problems have been developed during a creative workshop given by the professors, challenging the students with selected trends. On a few occasions, for students in sixth semester, the problems were rooted in their bachelor thesis. Inspired by the realism and relevance of the challenges identified from the bachelor thesis in 2016, professors from the engineering institutes were in 2017, invited to present challenges from their discipline.

An increased interest in sustainability arose in 2017 introducing open-ended sustainability problems to equip students with knowledge about why action is important and train how to solve open-ended problems. Ten different sustainability challenges, or cases, were spring semester 2018 introduced to the students in Modul 1. Table 2 illustrates an example with two of the sustainability issues presented. Both cases were from The Municipality of Bergen, department of construction and real estate. In Modul 2 students develop and pitched innovative business ideas and business models to an external panel. The ideas and solutions are analysed and made more advanced during Modul 3 - 5, resulting in competence achievement and value creation [4]. Case 1 is a Health and safety and Compliance (HCE) challenge, related to SDG target 8 (8.8 Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment), to promote safer and more secure working environments on how to reduce the annual number of injuries in line with a target zero initiative. Case 2 is also a HCE challenge related to SDG target 8 (8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high value added and labour-intensive sectors) on how to increase economic productivity, through technological upgrading, innovation and focus on labour-intensive activities.

Table 2 Example of cases with sustainability challenges spring semester 2018. Source: own work

Case	Sustainability issue	SGD	Value creation potential
1	HCE - secure working environment	8 (8.8)	Economic and Social
2	HCE - productivity topic	8 (8.2)	Economic and Social

Circular economy is perceived as a practical tool and mindset suitable for contributing directly to achieving some of the SDG targets [22]. Based on the experience described above, increased awareness of sustainability among young people like “Fridays for Future” and an external challenger to the engineering faculty, CE-cases were introduced to students’ spring 2019 (ref. Table 1). The first two CE challenges were explorative (‘how-to’ type of cases): (1) ‘upcycling’ in the construction industry; and (2) ‘resource astray and social entrepreneurship’ in The Salvation Army. The cases had at least two CE similarities. First, a need for better resource utilization [27]. Second, market failures, a typical trait for an economy moving towards CE and sustainable entrepreneurship [7]. Experience with CE from the test were challenging, but also promising. The approach was continued onward semesters with several improvements: (1) cases have to a large extent been organized in close collaboration with fewer external organizations, foremost Bergen Chamber of Commerce and Industry (BCCI); and (2) the CE concept have been included in the curriculum fall 2019. From fall semester 2020 the updated textbook edition contained a chapter on CE. Table 3 illustrates the timeline from spring 2019 until spring 2021, organized with attention to year/semester, type of challenge, challenge affliction, CE version (abbreviated V1-V5) and case owner:

Table 3 Timeline - the implementation “process” of CE. Source: own work

Year Semester	Challenge – type	Challenges affliction (External organizations)	Version CE	Case owner
2019 S	Sustainability “Upcycling” Resource astray	Two external organizations: Architect Company: construction materials Salvation Army: unused building and human resources	Test	External
2019 F	Sustainability Resource astray	One external organization, Salvation Army: Combine building- and human resources	V1	External
2019 F	Sustainability/CE: Plastic-smart Plastic-smart Plastic-smart Plastic-smart	<i>Bergen Chamber of Commerce (BCCI)</i> : Statsraad Lehmkuhl: plastic knowledge - education University Hospital: PVC recycling service - new products University Hospital: disposable in canteen and food service The New Bergen Aquarium: ocean plastic - new products	V1	External
2020 S/F	Sustainability/CE: Plastic-smart Plastic-smart Plastic-smart	<i>Bergen Chamber of Commerce (BCCI)</i> : Mollerens: Big bags (Bulk bags) for handling Industrial bulk Future for the Nature: Plastic hunt - attention, remove, ICT BIR: reuse of construction materials and buildings	V2-3	External
2021 S/F	Sustainability/CE:	<i>Bergen Chamber of Commerce (BCCI)</i> : Mollerens: Big bags (Bulk bags) for handling Industrial bulk Future for the Nature: Plastic hunt	V4-5	External

A brief description about how CE can be designed and structured for an educational setting is described under. The purpose is to create an idea of how CE are structured into the courses, by CE as a common platform and mindset. Table 4 illustrate the application of sustainability and CE in the two courses, including the three main questions of CE, marked with “why”, “what” and “how”. The four CE factors are abbreviated F1- F4: (F1) circular design; (F2) innovative business models (BM); (F3) value chains/reverse cycles; and (F4) enablers and accelerators.

Table 4 CE – structured into Module 1 – 5 in INGI01 and ØAA117. Source: own work

Module	Activity	Information
M1	Case intro Theory CE	Short video or one-pager presentation of CE cases Short intro: SDGs and CE (“Why”). Definitions (“What”)
M2	Case intro Theory CE Guidance Workshop Output-1 Output-2	Presentation of CE cases Definitions CE (“What”). CE Strategies (“How”) Case groups: cite-visit/on campus -> Knowledge Industry/CE Creativity & CE strategies (Butterfly, 3R-9R). F1: CE design Innovation day: pitch in front of external-panel -> feedback /knowledge Assignment: business idea, draft business model (BM)

Module	Activity	Information
M3	Theory CE	F2: innovative BM. F3: Value chain/circle. F4: Enablers
	Guidance	Case groups: on Campus -> Knowledge industry and four CE factors (F1-F4)
	Output-1	More realistic business -idea and model (BM) for the business plan (BP)
	Output-2	Draft BP: Analyse macro and micro-environment: F1 - F4
M4	Theory CE	F4 Enablers (cont.): regulations, collaboration, and digitalization
	Guidance	Groups: Feedback on drafted business plan -> More realistic business plan
	Output-1	Process: Write a realistic business plan and identify enablers and obstacles, F4
	Output-2	Present business plan (BP) for the case group and a panel
M5	Theory CE	No new theory presented in module 5. Apply textbook theory focus
	Guidance	Groups: Digital remotely chat about questions and answer (Q & A)
	Output-1	Group exam: Deliver a "realistic" BP and a one-pager -> grade-> feedback
	Output-2	Individual exam: Test knowledge and skills

### 3.4 Findings and results

Universities are facing challenges aligning its educational core activities to global macro trends of today, such as climate- and demographic-changes. For years we have had an interest for educational pedagogy and how new approaches and concepts can be implemented into an educational setting. In this paper we explore how CE has been implemented and can be designed and structured for an educational setting where entrepreneurial competence development and sustainable value creation can take place. In this subchapter we describe three main findings.

*The first main finding* is that the CE approach is perceived a common language and platform for EE problem solving rooted in real-life sustainability challenges. Entrepreneurial competence development and sustainable value creation can take place. Challenges presented for students up to 2017/2018 had an internal orientation, from spring 2018 cases have had external owners. The "journey" from general challenges based on trends to cases rooted in sustainability and CE is described in sub-chapter 3.3. Furthermore, educational activities in the era of 2017 to fall semester 2019 can be interpreted by high diversity across cases, lack of necessary CE theory, tools and strategies for sustainable development applying theory in practice. Several components "seemed to be lacking" for efficient and effective educational activities and value creation that struggle with market failure. An example is lack of a market for used building materials and big bags. In retrospect it seems clearer: (1) A CE approach seems to fit well into EE courses applying experiential learning; (2) An updated textbook including CE theory, in combination with online material is a good match to guide the work of students, supervisors and professors; (3) CE strategies facilitate the creative processes across cases and projects developing innovative business models; and (4) Student teams worked with cases from the Salvation Army spring and fall semester 2019, so far CE approach seems favourable also for cases rooted in human resources.

*The second main finding* is that real-life sustainability and CE cases call for simplification, to achieve effective educational activities across courses and programs: (1) EE pedagogy fits well implementing CE. We have several times experienced development problems when including new elements into courses and the semester schedule. Applying CE into ING101 and ØAA117 was relatively applicable after some semesters. (2) Internal collaboration can be effective to exploit limited resources, for example common cases and partial common lectures and supervision in EE courses. Meanwhile internal collaboration across educational programs can also be relatively challenging. (3) The real-life challenges are in general demanding, especially the first years with high diversity across cases (Ref. Table 3). From 2020 and onward, the practice has been one case owner and fewer cases with common sustainability and CE features, facilitating flexible and more efficient supervision, and (5) To a certain degree, demanding sustainability cases engaging CE are possible to reuse in the following semester after some adjustments and updating.

*The third main finding* is that open-ended CE-cases imply the need for external collaboration, and thus more structure: (1) A need for more guidance is experienced, to produce realistic solutions to real-life sustainability and CE-cases, (2) The knowledge needed is not always inside the University and/or internal collaboration across programs and faculties can be demanding. (3) A network for external collaboration with companies and organization is established in the region of Western Norway. (4) A framework for structuring collaboration-network for EE were developed in [10], and the use of student mentors were explored in [11], and (5) Professors' external orientations has been strengthened. In section 4 we will discuss the main findings and results.

#### 4. Discussions

*CE represent a common language and platform* for real-word sustainability problem solving. Furthermore, the circular strategies are useful for developing innovative business models. It is clearly seen from the literature that applying CE approach, its necessary to discuss and reflect about CE's suitability for social sustainability puzzle solving, as well as the human resource part of business models. Ref. [8] describe CE as a system that generate ecological, social, and economic value. [22] claims the most significant potential is for SDG 6, SDG 7, SDG 8, SDG 12, and SDG 15. In line with [8, 22] social sustainability is not at the core of CE. On the other side [23], describe CE as a beneficiary approach for circular business models with a social dimension. The experience with social sustainability cases from the Salvation Army (ref. Table 3), is that CE works well for human resource cases too. From the start, spring 2019, a broad approach to resources and effective utilization of these have been applied. The European Union expects that the transition towards CE will create a significant number of new skilled- and unskilled-jobs [9]. We realize that CE's social equity impact is to some degree unknow, and a topic for future research.

*CE- and sustainability-cases are demanding and call for simplification*, to achieve efficient EE activities across courses and programs. Collaborating across courses and educational programs offering demanding PBL-challenges call for simplification in co-creation of learning and sustainable value creation with external organizations. One or maximum two case owners seem optimal. This became clear after semesters working with several external case owners, high number of different case-challenges like for example upcycling of building materials and a solution for reusing big bags from food industry described in section 3.3. Meanwhile we are aware of the distinction in allocating recourses between exploration and exploitation [31]. Exploration seems to have been effective. We are aware of the distinction between short run and long run and will in the future include both new case-owners and cases.

*Open-ended CE-cases imply need for external collaboration* to facilitate guidance in EE, sustainable value creation and knowledge sharing. To ask questions about content, teaching methods and design we find essential. An important discovery was deduced from looking into the two different theoretical angles of this paper. This shows that there is a similarity between them when it comes to the importance of collaboration. In EE rooted in experiential learning and PBL, collaboration is encouraged by activities like co-participation in knowledge creation [14-15]. In sustainability-, circular economy-, and innovation-literature collaboration is embraced and regarded as a prerequisite, an enabler and accelerator, a road map to sustainable business, a source of competitive advantage and a prevailing model [23, 28-30]. Further, there is a common consensus in the literature for the need of broad collaboration in innovation and entrepreneurship to solve the sustainability challenges of today. Sustainable EE depends on a whole system of cooperation and internal and external networking. It can for example be business mentors, suggested in [10] or industry case-mentor with more domain specific knowledge.

*CE-cases in EE with external collaboration imply a need for better structure*, to facilitate development of entrepreneurial competence and sustainable co-creation of value. Research in [11] drafts a framework for a collaboration network around entrepreneurship courses between students, professors, courses, and stakeholders to solve problems that can end in sustainable ideas, solutions, and new knowledge. Structures across universities are challenging. It seems favourable also for universities to search for competence outside its wall, bringing the real world closer to the University in line with for example open-innovation and CE-literature [28-29]. This might lead to a more practical and outward orientation. For sustainable knowledge sharing attempts, there is a need for formalized collaboration routines at a higher level than professors and courses, to align the University with the needs of people, planet, and profitable organisations.

We see that this study has some clear limitations, because it is performed with preferably a professor- and student perspective. Student perspective has come through reference groups, mid-term evaluation, but then further interpreted by us professors. A deeper understanding of CE is achieved. There is a need for further empirical examination.

#### 5. Conclusion

The objective of this paper is to explore how universities also can contribute to solve the SDGs, through challenging student with sustainability issues and implementing CE. We have described and analysed an integrated sustainability and CE-action project, by discussing and highlighting CE approaches for competence development and sustainable



value creation. Two EE courses design and structure have been described as connected to the implementation of CE, requiring a need for a common language and a platform for sustainable value creation across teams, courses, and cases. The paper confirms CE suitability for problem solving rooted in SDG challenges of today.

Real-life cases rooted in sustainability and CE challenges are demanding for students, professors, and external case-owners. A clear understanding of the importance of simplifying have been described and discussed, leading to close collaboration with a few numbers of case owners over time. The challenges represent open-ended problems, lack of markets and regulations. Likewise, the complexity in the educational setting drives the need for a fixed structure and as well an organized external collaboration for exploitation and exploration of resources and learning.

There is a clear need for more guidance in line with experiential learning pedagogy. This will be further explored in our next study, looking into the role of industry case-mentors. This paper can also represent a contribution in the ongoing debate regarding the role of the University in society. The findings have important implications for further development of the two courses described here, and other EE and CE courses at HVL for example three new courses in sustainability, circular economy and digitalization planned to be offered first time fall 2022. In conclusion, we hope that this article will provide inspiration, guidance, and insight to stakeholders in higher education. It is critical that we continue to research around innovative projects for experiential learning, so that we can better understand the most efficient and effective means of supporting the needs for future graduates. Finally, given the limitations of this study, performed with preferably a professor perspective, we recommend further in-depth research to generate more empirical evidence on the connection between EE, sustainability, and CE.

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