Report for Work Package 2:
Evaluating leading approaches and tools in collaborative green venturing

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PROPOSAL FOR CITATION

Fichter, K., Hurrelmann, K., Seela, A., Hjelm, O., Kanda, W., Larsson, M., Sundberg, C., & Stel, F. (2020). *S4S Report on evaluating leading approaches and tools in collaborative green venturing (Work Package 2).* Oldenburg, Linköping and Zuidlaren.

Oldenburg, Linköping, Zuidlaren, 2020

Co-funded by the
Erasmus+ Programme
of the European Union

CONTENTS

INVENTORY

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

HEI   Higher Education Institution

S4S   ScaleUp4Sustainability

1 Aim and expected results of Work Package 2

We take the existing schemes and modules of collaborative green venturing of the involved higher education institutions (HEIs) and partners as a starting point of the S4S-project. We do this because they are one of the very few existing student-business collaboration exercises in green venturing (Fichter et al., 2016) and because there is a clear interest by the involved HEIs and partners to further improve, scale up and diffuse this innovative, learner-centered and real problem-based type of interactive learning with business partners. WP 2 serves as preparation for WP 3, 4 and 5 of the S4S-project.

Based on the project proposal, Work Package (WP) 2 has the following objectives:

(1) Developing a conceptual framework and guidelines for the evaluation of collaborative student-business venturing activities

(2) Generating insights on the effectiveness and impacts of existing approaches and tools in collaborative green venturing

(3) Identification of unique elements, success factors and barriers of student-business collaboration in green venturing

(4) Identification of strengths and weaknesses, as well as needs to improve and expand existing programs and approaches as basis for WP 3

(5) Insights on the transferability and scalability of existing approaches and tools to other university and regional contexts as basis for WP 3 and 6

(6) Producing a manual for evaluating collaborative student-business venturing activities and case study reports for publication.

The expected results of WP 2 are:

- Deliverable 1: Conceptual framework and KPIs for evaluating collaborative green venturing exercises
- Deliverable 2: Final case study evaluation report "student-business collaboration in green venturing"
- Deliverable 3: Guidelines for the evaluation of collaborative student-business venturing activities

These deliverables are provided in the following sections.

2 Theoretical background, conceptual framework and key performance indicators

The joint conceptual framework for evaluating collaborative student-business venturing programs will comprise relevant criteria and key performance indicators (KPIs) for outputs and outcomes and will serve as basis for the evaluation of existing green venturing schemes (see Section 3) and will be integral part of the evaluation manual (see Section 4).

The objectives of the conceptual framework are:

- a systematic and scientifically valid basis for evaluating collaborative green venturing exercises within the S4S-project as well as beyond

- a comparison of outputs and outcomes of collaborative green venturing exercises in different countries and settings of HEIs.

- assessment of student-business collaboration in green venturing and provides teaching staff as well as company staff (innovation manager, venturing manager, sustainability manager) and the identification of costs and benefits of this type of open innovation activity.

2.1   UNIT OF ANALYSIS AND EVALUATION

In the S4S-project we focus on existing approaches which have been implemented by lecturers and teaching teams of the University of Oldenburg (UOL), the Linköping University (LiU) and Vennebroek Academic Services (VAS) in the following modules:

(1) Eco-Venturing (UOL)

(2) Environmentally Driven Business Development (LiU)

(3) Fujifilm Future Challenge (VAS)

For the evaluation process three key stakeholders and targets groups can be differentiated:

(1) *Students*: Does the participation in (collaborative) green venturing influence their entrepreneurial and sustainability-related competencies, their values and worldviews, their entrepreneurial mindsets and intensions to start a business (in the long run) and their career?

(2) *Business partners* (venturing teams, start-ups, companies): How do they benefit from collaboration with students (and universities) in joint green venturing exercises? How do the outputs and outcomes of venturing activities influence the economic, environmental and social performance of business partners and which (intended and unintended) impacts on markets, society and the environment can be observed?

(3) *Teaching personnel*: How satisfied is the involved teaching personnel with collaborative green venturing exercises and modules? How does it influence their competencies, values and worldviews? Which impact does the exercise have on education programmes and transfer activities of the respective university and on other HEIs. Is the approach scaled up or diffused?

For the evaluation of collaborative green venturing exercises, different phases have to be considered:

(1) Preparation

(2) Implementation

(3) Follow-up action and impacts.

2.2   USEFUL THEORIES AND CONCEPTS

Literature provides a vast array of relevant theories and conceptual frameworks for evaluating student-business collaboration in green venturing. After a review of relevant literature and previous research projects (see e.g. the SHIFT project[1] and Erasmus CASE-project[2]), five research streams and theories seem to be especially suitable as a basis for our conceptual framework:

- Sustainable entrepreneurship,

- Sustainability-oriented business model development,

- Knowledge spillover theory of entrepreneurship,

- The concept of entrepreneurial ecosystems and,

- The theory of change.

These research streams and theories will be briefly presented in the following.[3]

2.2.1   Green venturing as a specific form of sustainable entrepreneurship

The S4S project is being implemented based on the notion that there is a clear need to upscale existing approaches of university support for sustainable entrepreneurship and to introduce and diffuse new forms of student-business collaboration in developing and implementing eco-innovations and starting new green businesses. We refer to this activity as „green venturing". Venturing is an integral element of entrepreneurship and emphasizes the creation of new business within an organization (new products or business units) or outside an organization (spin-offs, start-ups). With "green" we refer to the concept of a Green Economy4 and the notion of a triple bottom line, which seeks to generate economic benefits with products, services and processes that are beneficial for society and the natural environment. Green venturing can be categorized as a specific form of sustainable entrepreneurship. Therefore, we briefly address this research stream in the following.

Sustainable entrepreneurship is a young research field that is still developing. Since 2009, the number of articles published on sustainable entrepreneurship has increased significantly (Binder & Belz, 2015; Gast et al., 2017). While many of these articles emphasize opportunity seeking as being key to sustainable entrepreneurship, another important thread of literature highlights a creative and effectuation-based approach (Hockerts & Wüstenhagen, 2010; Parrish, 2010; Schaltegger & Wagner, 2011) that adopts a creation perspective. Such research emphasizes the active role of ecopreneurs and sustainable entrepreneurs in creating sustainability-oriented change (Boons & Lüdeke-Freund, 2013; Schaltegger et al., 2015). This perspective is particularly important for a creative view of universities supportive of sustainable entrepreneurship. In WP 2 we view sustainable entrepreneurship, in accordance with Pacheco et al. (2010), as the discovery, creation, evaluation, and exploitation of opportunities to create innovative goods and services that are consistent with regional, national, or sustainable development goals (Schaltegger et al., 2018; United Nations General Assembly, 2015). Creating, recognizing, and taking advantage of sustainable opportunities are complex challenges for sustainable entrepreneurs and demand

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[1] See http://www.shift-project.eu (Accessed on 11 April 2019).

[2] See https://www.case-ka.eu (Accessed on 11 April 2019).

[3] Some parts of Section 2.2.1, 2.2.3, 2.2.4 and 2.2.5 are taken from Wagner et al. (2019).

[4] See https://ec.europa.eu/environment/basics/green-economy/index_en.htm (Accessed on 11 April 2019).

specific support systems. An effective support system incorporates all actors, institutional settings and resources that help entrepreneurs in innovating successfully (Fichter et al., 2016). In this paper we concentrate on the interaction between universities and business partners as important supporting process. We assume that, on the one hand, some personal attributes of entrepreneurs such as the individual's prior knowledge and motivation (Shepherd & Patzelt, 2011), sustainability orientation (Kuckertz & Wagner, 2010; Wagner, 2012) and perpetual reasoning (Parrish, 2010) can be influenced by the knowledge spill-overs they receive within the university context. On the other hand, universities are also able to support external economic actors like SMEs or start-ups in developing and establishing sustainable and often technology-driven products through their research and development (R&D) resources (Abdelkafi & Hansen, 2018).

2.2.2 Sustainability-oriented business model development

A core element in green venturing is business model development. Literature on sustainability-oriented business model development has increased significantly in recent years (Pieroni et al., 2019). Breuer et al. (2018) suggest the following principles and process-related criteria for sustainability-oriented business model development:

Table 1: Principles and process-related criteria for sustainability-oriented business model development

Guiding principles	Process-related criteria
Sustainability orientation	Reframing business model components
Extended value creation	Context-sensitive modelling
Systemic thinking	Collaborative modelling
Stakeholder integration	Managing impacts and outcomes

Source: Breuer, Fichter et al., (2018, S. 279)

Fichter and Hurrelmann (2020) provide an overview of methods and tools for sustainability-oriented business model development that have been developed and introduced in recent years.

Table 2: Methods and tools for sustainability-oriented business model development

Method/tool	Introduced in practice in …	Key target group
Business Innovation Kit/ Values-Based Business Model (Breuer & Lüdeke-Freund, 2017b, 2017a)	2014	Start-ups/ Established Companies/ Higher Education
Business Model Canvas Extended for Infrastructure (Foxon et al., 2015)	Unknown	Unknown
Cloverleaf Business Model Canvas (Jonker, 2016)	2014	Start-ups/ Established Companies/ Higher Education
Five step Sustainable business modelling (SBM) process (Evans, Rana, & Short, 2014)	Unknown	Unknown
Flourishing Business Canvas (Upward & Jones, 2016)	2014	No
Lean Impact Measurement (Horne, Recker, & Michelfelder, forthcoming)	2017	Start-ups
Manual for the sustainability assessment of start-ups (Trautwein et al., 2018)	2017	Start-ups
Methods for Sustainable Product- & Business Model Innovation (Gerlach, 2017)	2014	Start-ups/ Established Companies/ Higher Education
Sustainable Business Canvas (Tiemann & Fichter, 2016)	2015	Start-ups/ Established Companies
Sustainable Business Model Taxonomy (Lüdeke-Freund, Carroux, Joyce, Massa, & Breuer, 2018)	2018	No
Sustainable Value Analysis Tool (Yang, Vladimirova, & Evans, 2017)	2013	Start-ups/ Established Companies/ Higher Education
Sustainable Value Exchange Matrix (Morioka, Bolis, & Carvalho, 2018)	no	No
Triple-Layered Business Model Canvas (Joyce & Paquin, 2016)	2014	No
Value ideation (Geissdoerfer u. a., 2016)	2014	Start-ups/ Established Companies/ Higher Education/ Organisational Units
Value Mapping Tool (Bocken, Short, Rana, & Evans, 2013)	2012	no

Source: Fichter and Hurrelmann, (2020)

These methods and tools can be considered by students, start-ups and established companies in collaborative green venturing. Pieroni et al. (2019) differentiate the functional role of methods and tools in three categories: First, they can help in identifying opportunities (sensing). Second, they can be applied for designing new business model concepts for sustainability (seizing). Third, methods/tools can support experimenting, testing, and implementing the business model concepts (transforming). Bocken et al. (2018) emphasize the importance of experimentation and the on-going 'learning by doing' process for sustainability-oriented business model development.

2.2.3 The knowledge spill-over theory of entrepreneurship

While traditionally governments have played a dominant role in fostering knowledge diffusion, universities have become increasingly important contributors to that task. The university has been transformed from a pure teaching institution via the Humboldtian notion of combining teaching and research to one that increasingly takes on a third, societal role in regional and economic development by supporting and creating knowledge spill-overs (Agarwal et al., 2010; Etzkowitz & Leydesdorff, 2000) into the regions

where they are situated (Etzkowitz & Klofsten, 2005). The triple helix model linking of teaching, research and development has gained importance as an analytical device for studying this development. Similarly, the knowledge spill-over theory of entrepreneurship helps to understand how this shapes entrepreneurial ecosystems and innovation systems (Agarwal et al., 2007; Audretsch & Belitski, 2013). For example, regional governments, business partners and universities cooperate to establish and operate incubators in which social or environmental entrepreneurs are supported (Cohen, 2006). In the S4S-project, we focus on the role of student-business collaboration in green venturing from a knowledge-based view building on the knowledge spill-over theory of entrepreneurship (Agarwal et al., 2007) and the notion that the entrepreneur is the primary conduit of transmitting knowledge spill-overs (Audretsch & Belitski, 2013). New knowledge and ideas are a source of entrepreneurial opportunities, and therefore a lack of entrepreneurship may lead to low returns of knowledge. Qian and Acs (2013) underline: ''(1) knowledge constructs one source of entrepreneurial opportunities; and (2) entrepreneurial actions of appropriating the value of such opportunities involve the creation of new firms'' (p. 188). We consider the process of new knowledge commercialization through knowledge spill-over as a key determinant of innovation and growth in industries and regions (Audretsch & Belitski, 2013) as well as a potential factor for sustainable development within a region (Simatupang et al., 2015).

When asking what kind of knowledge is spilling over from which actor in collaborative green venturing, we can build on a conceptual framework which has been developed in preparing the project application for S4S (see detailed project description, p. 55). Figure 1 displays examples of potential knowledge spill-overs in student-business collaboration in green venturing.
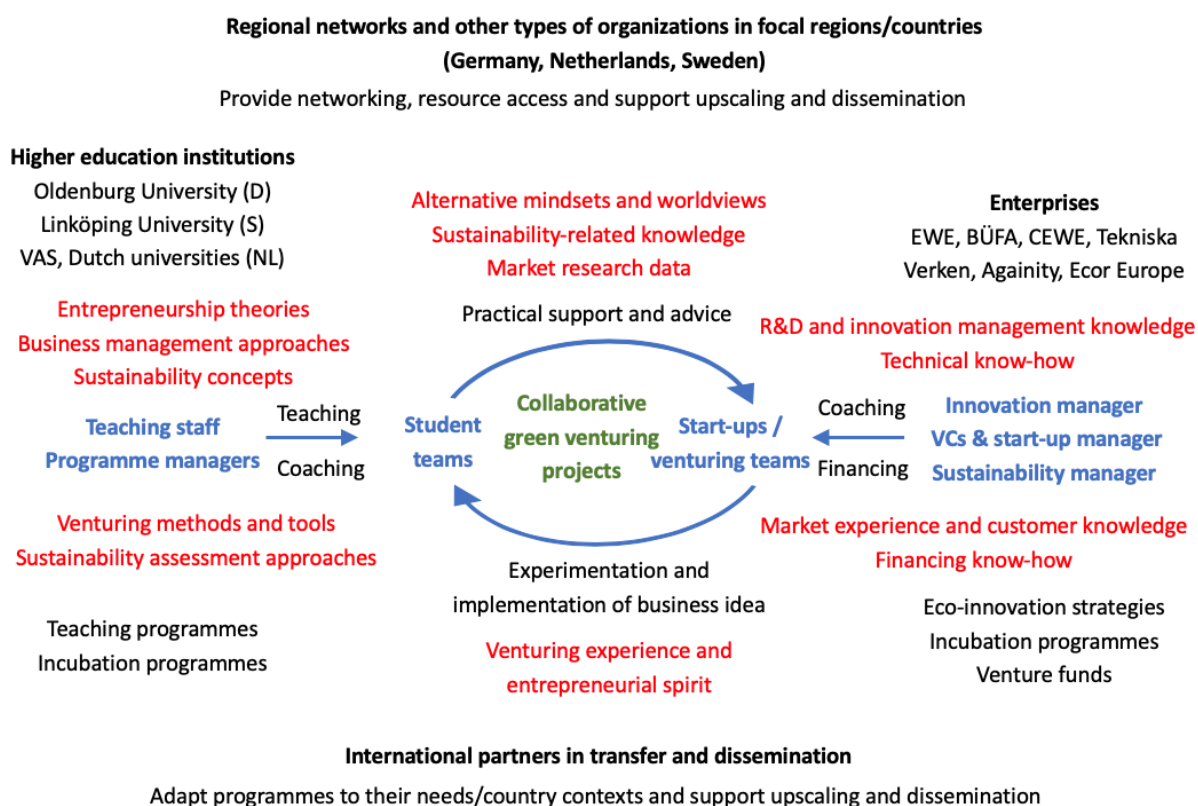
Figure 1: Examples of knowledge spillovers in student-business-collaboration in green venturing.

2.2.4 Entrepreneurial ecosystems: The role of universities in facilitating green venturing

'Entrepreneurial universities', which emphasize their role in regional economic development next to the more traditional role in teaching and research, are an important element of (regional) innovation systems (Rothaermel et al., 2007) and entrepreneurial ecosystems (Theodoraki et al. 2017). The concept of innovation systems and the entrepreneurial ecosystems approach are helpful in investigating and explaining the role of university-related support programmes for entrepreneurship and their effects on different levels (regional, national, international) of sustainable development. Both concepts focus on the external business environment and emphasize that there are forces beyond the boundaries of an organization but within those of a region that can contribute to a firm's overall competitiveness and impacts (Stam and Spigel 2016). Besides similarities there are also differences between the concepts, for example, in regard to the role of knowledge: While the concept of innovation systems emphasizes the importance of knowledge spill-overs from universities and other large research intensive organizations, the approach of entrepreneurial ecosystems stresses the crucial role of entrepreneurial knowledge in the innovation process (Stam and Spigel 2016). WP 2 can benefit from both concepts, and accordingly we build on both.

An entrepreneurial ecosystem can be defined as "a dynamic community of interdependent actors (entrepreneurs, suppliers, buyer, government, etc.) and system-level institutional, informational and socioeconomic contexts" (Audretsch & Belitski, 2017, S. 1034). With regard to the units of analysis of our investigation (student-business collaboration, support programmes and their outputs, outcomes and impacts) two aspects of entrepreneurial ecosystems are especially relevant: 1) What functions can they provide for collaborative green venturing between universities and businesses? and 2) What effects are relevant from the viewpoint of sustainable (regional) development? Entrepreneurial ecosystems and in a similar fashion innovation systems provide different *'functions'* to the actors embedded in them (Markard & Truffer, 2008; Erik Stam, 2015; Theodoraki et al., 2017). These include knowledge development and diffusion, provision of education and training, entrepreneurial experimentation, incubation activities, financing of innovation processes, provision of consultancy and networking and interactive learning, as detailed in Table 3.

Table 3: Functions of entrepreneurial ecosystems and innovation systems

(based on Markard and Truffer 2008: 602).

- Provision of education and training
- Knowledge development and diffusion
- Provision of R&D
- Influence on the direction of search
- Entrepreneurial experimentation
- Incubation activities
- Resources mobilization
- Financing of innovation processes
- Market formation
- Creation of legitimacy
- Networking and interactive learning
- Provision of consultancy
- Creation/change of institutions

2.2.5 Theory of change

Our evaluation research investigates how collaborative green venturing between students and businesses and the different forms of knowledge spill-overs they create can foster sustainable entrepreneurship that impacts sustainable (regional) development. Given the key role of universities, which are often non-profit organizations, and the emphasis on ultimate impacts, our analysis draws on logic models and the closely-linked concept of a theory of change which serves a prominent programme evaluation role in the non-profit sector (Carman, 2010; Funnel & Rogers, 2011). The theory of change draws on defining linear cause and effect chains from programme implementation to societal impact (McLaughlin & Jordan, 1999). Similar models are used in the context of corporate philanthropy (London Benchmarking Group, 2004), corporate-NGO partnerships (Hansen & Spitzeck, 2011, S. 201) and in performance measurement in the area of corporate sustainability (Epstein & Roy, 2001) and start-up venturing (Ney et al., 2014). Notably, a logic model or, taking a narrative perspective, a theory of change assumes a linear causality between inputs, activities, (immediate) outputs, outcomes and impacts as is detailed in Figure 2.
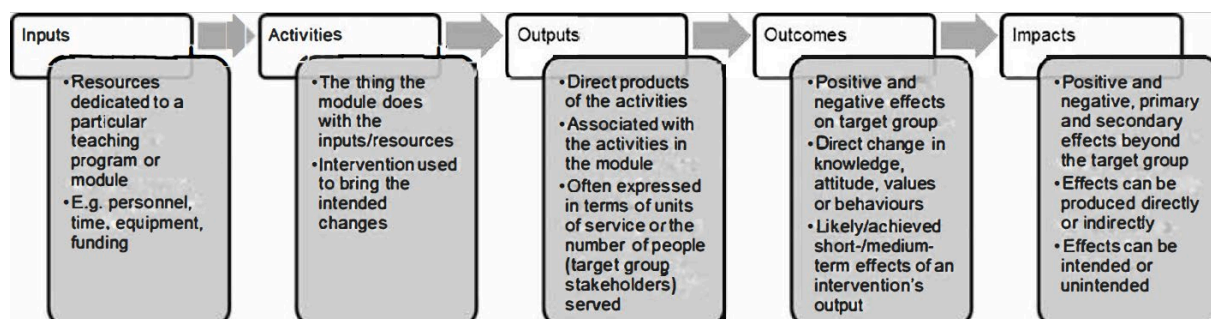
Figure 2: Theory-of-change framework formulating a logic model

(based on Carman, 2010; Clifford, Hehenberg, & Fantini, 2014; OECD, 2002).

We maintain that the theory of change can be fruitfully applied to analyse effects of student-business collaboration in green venturing. While the linear logic has been used widely and contributes to a straightforward analytical understanding, it also represents an approximation of cause and effect chains existing in reality. It is also based on the assumption that creating educational programmes, teaching students, organizing collaborative venturing activities, developing entrepreneurs, and facilitating new ventures ultimately matter and generate impact in the larger system. But identifying or even measuring effects from one to the next logical step becomes harder (and more resource intensive) the more we move from left to right. Finally, while this linear logic model can only cover the most important causalities, other iterative or non-linear relationships could be neglected. However, by covering these most important causalities, the linear logic we apply appears a good first approximation for our research question.

There is an important difference between outcome and impact. Outcomes describe the effects of an (educational, venturing) activity on the target groups (e.g. students, involved business partners, teaching personnel). Impact describes the contribution that the outcomes have beyond the target group, in the larger system. For example, on the impact level environmental benefits like the reduction in greenhouse gas emissions resulting from environmentally friendly product or service of a new green venture which has participated in a collaborative student-business venturing exercise are measured. Next to environmental indicators also economic indicators (e.g. jobs created in a specific region) or social indicators (e.g. solved problems of customers) should be considered in regard to the impact dimension. The effects on the impact level can be seen as a result of the improved performance of a company that has participated in a collaborative green venturing exercise.

The step to impact can be seen as a reality check in which four so-called counterfactuals (Clifford et al., 2014) are deducted from the outcome:

- ▪ Alternative attribution refers to outcomes that were caused by others (e.g. other green ventures in the region that helped customers to reduce greenhouse gas emissions)

- ▪ Deadweight refers to what would have happened anyway (e.g. if 6 of 15 students in the module would have started a green business anyway due to their prior competencies and entrepreneurial intentions)

- ▪ Displacement describes the relocation of negative effects (e.g. a new green venture outcompetes established market players which leads to the lay-off of employees)

- ▪ Drop-off describes the decreasing effect (outcome) of the collaboration over time (e.g. the currentness of data from a market analysis provided by students might decrease over time).

2.3   CONCEPTUAL FRAMEWORK

Based on the theoretical background presented in the last section, we now design a conceptual framework for the evaluation of existing modules of student-business collaboration in green venturing. The framework has to take the objectives of our investigation into account which are presented in Section 1. Building on these, the following focal aspects and guiding research questions can be formulated:

- ▪ What are the interests and motivations of participants (teaching personnel, students, business partners) and other stakeholders (e.g. central staff of the university)?

- ▪ Who have been the key persons/promoters in setting up and implementing the module?

- ▪ What have been the success factors, drivers and barriers for the implementation of the module?

- ▪ Are there any unique elements in the design and implementation of the module?

- ▪ What are the strengths and weaknesses of the module?

- ▪ Is there a need for improving and expanding existing modules or programmes?

- ▪ To what extend are the modules scalable and transferable to other HEIs and regions?

- ▪ What are the impacts of the modules, how effective are they?

The unit of analysis of our investigation has been defined in Section 2.1. Based on the theory of change (see Section 2.2.5), our evaluation will investigate the inputs, activities, outputs, outcomes and impacts of the module of student-business collaboration in green venturing. In our conceptual framework, we also draw on concepts of sustainable entrepreneurship, the knowledge spillover theory as well as on the entrepreneurial ecosystem concept. We will describe the characteristics of the module (initiating university, starting year etc.) as well as the design of the module. The later will be based on the pedagogical framework provided by the CASE-project (Bernhardt et al., 2017, S. 10 ff.), insights on key competencies, values, worldviews and opportunities of sustainability-driven entrepreneurship (Biberhofer et al., 2019; Lans et al., 2014) and process-based framework for entrepreneurial mindset development in entrepreneurship education (Ndou et al., 2018). The conceptual framework is displayed in the following .

Focal topics and guiding research questions

Motivation/interest of participants?   Promotors/ key persons?

Unique elements?   Strengths/weaknesses?   Need for improvement?

Drivers, barriers, success factors?   Scalability/transferability?   Impacts and effectiveness?

Theoretical background

Theory of change

Sustainable entrepreneurship

Knowledge spillover theory

Entrepreneurial ecosystems

Unit of analysis:
Modules of student-business collaboration in green venturing and their impacts

Inputs	**Activities**	**Outputs**	**Outcomes**	**Impacts**
Module characteristics: Fact sheet		Direct results of activitiies	Effects on the target groups:	Effects on the larger system
• Initiating university, start year etc.		• Products	• Students	• Economic
Module design:		• Units of service	• Business partners	• Social
• Learning pedagogy		• No. of people served	• Teaching personnel	• Environmental
• Entrepreneurship/Sustainability content				
• Stakeholder engagement/involvement				

Key performance indicators (KPIs)

Interaction with stakeholders of the entrepreneurial ecosystems

Figure 3: Conceptual framework for the evaluation of student-business collaboration in green venturing

2.4   KEY PERFORMANCE INDICATORS

Key performance indicators (KPIs) are helpful to assess, measure and manage teaching programmes and single modules. Therefore, we will use selected KPIs to evaluate and assess existing modules of student-business-collaboration in green venturing. It seems useful to cluster the KPIs according to the theory of change alongside the effect chains from programme implementation to societal impacts. The development of useful KPIs for our purpose is an iterative process. We start with defining some selected KPIs prior to our investigation. We assume that the interviews and surveys of our evaluation research generate insights on the usefulness of selected KPIs and on the need to use additional KPIs.

Table 4: Examples of KPIs, which can be used in the evaluation of collaborative green venturing

Input	Activities	Output (direct results of activities)	Outcomes (effects on target groups)	Impact (effects on the larger system)
▪ Teaching personnel: Total workload for preparing, implementing and follow-up of the module (in hours) ▪ Students: Actual workload/working hours in relation to the credits points of the entire module ▪ Business partners: Total workload for preparing and implementing the module	▪ Total no. of teaching personnel and number of universities/professorships involved ▪ Total no. of participating students (incl. background and education level) ▪ Total no. of business partners involved (possible characterizations: age, size of companies FTE, sales, branches) ▪ No./ percentage of (sustainable-oriented) methods and tools used for collaborative green venturing ▪ Number of used (green) tools and methods for green venturing ▪ Number of direct interactions student-business/ use of collaboration tools	▪ Degree of satisfaction of students, business partners, teaching personnel ▪ Degree of improvement of entrepreneurship / sustainability competencies ▪ Increase of entrepreneurial spirit by students ▪ Increase in interest to start a green business (in the long run) ▪ Number of significantly improved green business ideas or elaborated business models	▪ President, deans, no. of professors who rate the module as "very important" for the university ▪ No. of business partners with significantly improved performance (after 1, 2, 3 years) ▪ No. / percentage of venture ideas still persued or on the market ▪ No. / percentage of students or business partners who rate the module to be important for their career/ their business ▪ No. / percentage of students who have an increased level of interest in innovation and/or entrepreneurship and/or sustainability ▪ No. / percentage of students who work in a green venture / started their own green business ▪ No. / percentage of students who started their own (green) business ▪ No. / percentage of teaching personnel who is highly motivated and interested in collaborative green venturing	Economic ▪ No. of jobs created by business partners 1, 2 or 3 years after the module Social ▪ Number of significant contributions to social SDGs ▪ Number of people served Environmental ▪ Reduction in greenhouse gas emissions by sold green products/ services ▪ Number of significant contributions to environmental SDGs

displays examples of KPIs that can potentially be used in the evaluation.

We are aware of the fact that reliable data for KPIs on outcomes and impacts is hard to obtain. Nevertheless, we will explore to what extent data are available and how they can be related to the activities and outputs of collaborative green venturing. It is likely that we cannot measure outcomes and impacts precisely, but we will try to assess the linkage between activities and outputs on the one hand and outcomes and impacts on the other hand by using ordinal scales, e.g. from "no contribution" to "very high contribution".

Table 4: Examples of KPIs, which can be used in the evaluation of collaborative green venturing

Input	Activities	Output (direct results of activities)	Outcomes (effects on target groups)	Impact (effects on the larger system)
■ Teaching personnel: Total workload for preparing, implementing and follow-up of the module (in hours) ■ Students: Actual workload/working hours in relation to the credits points of the entire module ■ Business partners: Total workload for preparing and implementing the module	■ Total no. of teaching personnel and number of universities/professorships involved ■ Total no. of participating students (incl. background and education level) ■ Total no. of business partners involved (possible characterizations: age, size of companies FTE, sales, branches) ■ No./ percentage of (sustainable-oriented) methods and tools used for collaborative green venturing ■ Number of used (green) tools and methods for green venturing ■ Number of direct interactions student-business/ use of collaboration tools	■ Degree of satisfaction of students, business partners, teaching personnel ■ Degree of improvement of entrepreneurship / sustainability competencies ■ Increase of entrepreneurial spirit by students ■ Increase in interest to start a green business (in the long run) ■ Number of significantly improved green business ideas or elaborated business models	■ President, deans, no. of professors who rate the module as "very important" for the university ■ No. of business partners with significantly improved performance (after 1, 2, 3 years) ■ No. / percentage of venture ideas still persued or on the market ■ No. / percentage of students or business partners who rate the module to be important for their career/ their business ■ No. / percentage of students who have an increased level of interest in innovation and/or entrepreneurship and/or sustainability ■ No. / percentage of students who work in a green venture / started their own green business ■ No. / percentage of students who started their own (green) business ■ No. / percentage of teaching personnel who is highly motivated and interested in collaborative green venturing	Economic ■ No. of jobs created by business partners 1, 2 or 3 years after the module Social ■ Number of significant contributions to social SDGs ■ Number of people served Environmental ■ Reduction in greenhouse gas emissions by sold green products/ services ■ Number of significant contributions to environmental SDGs

3 Case study evaluation report "student-business collaboration in green venturing"

3.1 RESEARCH DESIGN AND METHODOLOGY

3.1.1 Methodology

In order to fulfill the objectives of WP 2, the S4S-Project team has identified several research questions, which are relevant for the evaluation of leading approaches and tools in collaborative green venturing. The guiding research questions are presented in Section 2.3. Additionally, more specific questions should be investigated, like e.g. what are the requirements to take part at the module or how many ideas have survived?

To avoid a self-evaluation bias, the three university teams evaluate the modules of the other universities. Data collection will be based on agreed standards (method and tool collection template, fact sheets for each module), interview guidelines and questionnaires. For reasons of language and access to local/regional participants, the data collection in regard to students and business partners will be done by each research team for its own module. Based on the collected data, the three research teams will evaluate the module of another university:

- VAS will evaluate the Eco-Venturing module at the University of Oldenburg (UOL)

- UOL will evaluate the Environmentally Driven Business Development module at Linköping University (LiU)

- LiU will evaluate the Fujifilm Challenge.

The evaluation includes interviews with the teaching personnel as well as drafting an evaluation research report. The cross-case analysis will be drafted by the work package leader (UOL) and jointly discussed and finalized.

We apply a multi-case-study research design with the following elements:

(1) In the first step, it is necessary to get an overview of the tools and methods which are already in use by the lecturers in the different modules. Therefore, we compile a list of methods and tools already in use or intended to be used in the future.

(2) In the second step, the members of the evaluation team should get a general overview of the objectives and characteristics of all modules. Each teaching teams describes the characteristics of its module and provides a "fact sheet".

(3) The third step is based on semi-structured interview guidelines which are the same for each module. Each teaching team will conduct exploratory interviews with a small number of students (three or four) who have participated in the module. The interviews serve as a basis for developing a questionnaire. For the interviews only students from the last three cohorts will be selected to secure that they still sufficiently remember their participation and its outputs, outcomes and impacts.

(4) Parallel to the interviews with students we will also conduct interviews with the business partners of the last three cohorts. The business partners will be involved as experts and interviewed in regard to success factors, barriers and impacts and needs to improve existing green venturing schemes.

(5) In the fifth step a survey with the students of the last three cohorts will be conducted.

(6) In a sixth step, interviews with the teaching personnel will take place.

(7) Based on these steps, case study evaluation reports for each of the three modules will be produced.

(8) Finally, we will do a cross-case evaluation analysis in order to answer the guiding research questions formulated in Section

3.1.2 Timetable - evaluation process

In the S4S-project the evaluation was organized as follows:

- The overview of tools and methods is provided by each team (March 2019)

- The Fact sheet is provided by each team (March/April 2019)

- The interviews (July – October 2019) and the surveys (October – November 2019) are done by each research partner (including transcription and translation)

- Writing the analysis with an agreed structure (Draft by December 2019)

(1) VAS will write the evaluation report on the Eco-Venturing module at UOL.

(2) UOL will write the evaluation report on the Environmentally Driven Business Development module at LiU.

(3) LiU will write the evaluation report on the Fujifilm Challenge.

End of March 2020: Final report for WP 2 is delivered.

3.1.3 Collection of applied methods and tools

For collecting relevant methods and tools, a joint list of methods and tools which are currently used and planned in the three modules was drafted. Find the final list in Annex 1.

3.1.4 Fact sheets for each module

In order to collect relevant facts and figures about the characteristics of the three modules, we developed a standardized fact sheet. The fact sheets define a common understanding of each module. Find the template for the fact sheet in Annex 2. The fact sheets for each module is integrated in the evaluation reports (see Section 3.2.1, Section 3.3.1, and Section 3.4.1).

3.1.5 Interview guidelines

Based on relevant theories and concepts (Section 2.2), the conceptual framework (Section 2.3), key performance indicators (Section 2.4) as well as the overview of applied methods and tools (Annex 1) and the fact sheets for each modules, the S4S-project-partners developed guidelines for interviews with students (see Annex 3), business partners (Annex 4) and lecturers (Annex 5). For each module 4 to 6 exploratory interviews with student and companies were conducted. The interviews should facilitate a detailed feedback from individual participants and serve as basis for evaluation and for the survey with students.

3.1.6 Survey

Given the fact that next to teaching personnel and business partners the group of students is by far the largest group of participants in green venturing modules, we decided to do a survey with the participating students. The questionnaire is based on the conceptual framework (Section 2.3) and the results of the explorative interviews. The questionnaire is provided in Annex 9, first with all the questions listed followed

by one of the surveys as it was presented to the students via SurveyMonkey. Due to differences in content and setup for the modules there are some small differences in the questionnaires which all are addressed in Annex 9.

The questionnaires were sent out digitally to all the students that had participated in one of the modules during the last three cohorts. They were sent out in mid-October 2019 and open for five weeks, during this period reminders were sent out a total of three times before closing the survey. Due to a low response rate for Fujifilm Future Challenge the last reminder was performed in person instead of via email and the survey was open two weeks longer for this module. The number of students receiving the questionnaire and the response rate was:

- Eco-Venturing: 50 students of which 14 responded (28%)
- Environmentally Driven Business Development: 75 students of which 25 responded (33%)
- Fujifilm Future Challenge: 132 students of which 12 responded (9%)

The low response rate for Fujifilm Future Challenge implies that the results from this survey shall be interpreted with caution.

- When compiling and analysing the surveys the following themes were applied:
- Characterization of the responding students
- Motivation and interest
- Background to project work on developing business ideas
- Assessing the module
- Outcomes
- Impacts
- Suggested improvements

The results from the surveys are presented separately for each module in section 3.2.3, 3.3.3 and 3.4.3.

3.2 CASE STUDY EVALUATION REPORT 1: ECO-VENTURING (GERMANY)

3.2.1 Fact sheet

Factsheet Student/Business cooperation in green venturing S4S

Status: 19 March 2019

Module **in general**

Title of module	**Eco-Venturing**
Initiating university	**University of Oldenburg**
Start year	2009
End year / ongoing	ongoing
No. of modules held	10
Duration (weeks)	1 semester (24 weeks)

ECTS	6
Module objective(s)	The main target of the "Eco-Venturing" module is to develop entrepreneurial skills for the development and implementation of environmental innovations and sustainable business ideas. These include: • the ability to identify new solution needs in the context of sustainable development and the sustainable development goals set by the United Nations, • Knowledge and skills for the entrepreneurial development and implementation of innovative solutions, • Knowledge and skills for systematically combining economic (Economical) and ecological (Ecological) objectives and • the ability to strategically develop "green" business areas and markets. The entrepreneurial development and implementation of environmental innovations can relate both to the establishment of new companies (start-ups) and organisations and to the development of new solutions and business ideas within the framework of established companies and organisations (corporate venturing).
Phases & activities (in keywords only)	• **Before module starts (April to September)**: Scouting and selection of green and innovative venturing ideas • **October: Kick-off day** 1: Presentation of venturing ideas by business partners and getting to know each other • Kick-off day 2: Composing student teams, knowledge-input (methods and tools of sustainable business modelling) • Independent work within project groups and coaching by teaching team: Project clarification, understanding of business requirements, working according to the project plan • **December: Intermediate presentation**: students present draft business model and first results • Independent work within student teams and coaching by teaching team: Working according to the project plan • **February. Final presentation** for business partner and class • **March: Writing of final project report**
No. of business projects so far	49

No. of business partners so far	49
No. of students so far	154

Balance involvement between Business / Student:

Student involvement per module

(Characteristics of students typically included in the module)

No. of students	15-20
Level of students	Bachelor level ☐ Master level ☒ PhD level ☐
Background students	Technical; Managerial; Environmental; mostly Sustainability Economics and Management. ☐ ☐ ☐ ☒
No. of universities/ professor-ships involved	2
Number of Faculties involved	1

Business involvement per module

(Characteristics of business partners typically included in the module)

No. of companies/ venture teams/ start-up teams:	4 to 6	
Age of business partners	Pre-seed (1-3 months):	☒
	Seed (4-12 months):	☒
	Start-up (1 year):	☒
	1st Stage (1-3 years):	☒
	2nd Stage (4-6 years):	☒
	3rd Stage or later (>6 years):	☒
Size of companies FTE (no. of companies)	Single entrepreneur:	10
	Venture team (<5 employees):	15
	Micro enterprise (5-10 employees):	12
	Small (10-25 employees):	4

	Medium (25-250 employees):	5
	Large (>250 employees):	3
Size of companies sales (no. of companies)	None	25
	Small (<1mln €)	16
	Medium (1-10€)	9
	Large (>10€)	3
Typical Branches (no. of companies)	Industry Services Government Not for profit [X] [X] [ ] [ ]	

Sustainability items covered

People issues (social)	Yes/ no (covered as a side aspect, e.g. benefits for developing countries)
Planet issues (sustainable)	Yes
Profit issues (business)	Yes
keywords of sustainable subjects covered (max 10)	Renewable energies, energy efficiency, circular economy, sustainable mobility, renewable materials, green IT, clean clothing, cleantech, emission reduction and control

Personal assessment (qualitative)

Which activities & methods have been effective:	Which improvements could be made:
Project guidelines, workplan template, online pool of various business development tools, sustainable business canvas, sustainability scoring guidelines, value chain analysis, Porters five forces, guidelines for presentations, joint kick-off meetings with business partners, coaching student teams	• The workload for students is much higher than in other modules and too high in relation to 6 credit points • The intention is to have a good mix of students with different disciplinary backgrounds (management, engineering, computer science, environmental studies etc.), but in recent years the participants were mostly only from one master programme (Sustainability Economics and Management). • We would like to offer the module to more students, but our teaching capacity is limited to one module per year and 15 to 20 students.
Main outcomes of the module	• Students enjoy hands-on start-up experience and real-world learning with business partners. • They get sensitized for the option to start new venture and what it feels to be an entrepreneur

	- They learn how develop business ideas with the aim and consideration of sustainability - Some students join the venture after the module - We accelerate promising green venture ideas and help to be sufficiently critical about innovative ideas that don't meet a need.

3.2.2 Explorative interviews with students

Characterization of the interview partners

All three interviewees have a connection to sustainability in their careers. Even before attending the Eco-Venturing module, sustainability was of great importance to the respondents. Either by choosing appropriate modules and/or by promoting a sustainable lifestyle. The respondents had no direct connection to entrepreneurship before taking part in the module. Some of them had already been interested in this topic before. All interviewees completed the Sustainability Economics and Management Master either in the winter semester 2016/17 or in the winter semester 2017/2018.

Motivation and interest

All respondents participated in the module due to the high level of theory/practice transfer. An important motivation was the joint work on business models with companies and start-ups.

Before the module, there was no significant interest in innovation topics among the respondents. All respondents were already interested in sustainability due to private activities or by taking part in other sustainability related modules. The interest in entrepreneurship was expressed indirectly in some cases, e.g. by attending corresponding modules. No interviewee has founded a company yet. Apart from the engagement in a student company. The previous experiences with concrete activities in the areas of sustainability, innovation and entrepreneurship especially refer to case studies or theses.

The personal interest in sustainability as well as the focus of the Sustainability Economics and Management Master are reasons why the interviewees had already dealt with sustainability challenges before selecting the module. It was possible for the respondents to use some of these experience and skills in the Eco-Venturing Module. Some of the tools and methods used in the module were already known from other courses.

The Activities

All projects of the business partners were directly related to sustainability, such as the development of business models for sustainable and vegetarian fish feed or sustainable yarns.

From the point of view of the interview partners, the respective tasks for the student teams (4-5 persons) were very concrete. For the students, however, the workload for the module was difficult to estimate. The tasks included, for example, conducting a competitive analysis, developing a marketing concept, reviewing the existing business model or expanding the business model to integrate new customer groups.

Some of the teams have become familiar with tools and methods that exceed the teaching content of the module. These were relevant for the fulfilment of the task (e.g. communication platforms, empirical research methods). In addition to established tools for strategy development (e.g. SWOT analysis, project management tools, market analyses, cost-benefit analyses), the Sustainable Business Canvas was also applied.

Support of lecturers

The support provided by lecturers and mentors was generally rated positively by the respondents. Overall, the module was also associated with a high level of self-responsible learning processes. However, it was

not always clear to the interviewees to what extent the content of the supervision was coordinated between lecturers and mentors.

Biggest challenge

All respondents described time and project management as a major challenge. In some cases it was also difficult to balance the different demands of business partners and lecturers. The short-term familiarisation with new tools and methods was also seen as a challenge. However, all the necessary tools and methods could not have been taught in the module, as the tools and methods used in the individual project groups were very different.

Assessing the module

The strong practical relevance, the work on existing business models and the promotion of teamwork are regarded as strengths of the module. The module also makes it possible to establish business contacts. The module is associated with a high workload. Therefore, the increase of ECTS could be considered. An extension to two semesters was not positively evaluated, since a uniform team set-up over two semesters would not always be guaranteed. The module can also be increased by the number of students or transferred to other universities. On the other hand, the quality of supervision would probably no longer be guaranteed if the number of students would be increased.

Outputs and outcomes

From the students' point of view, the business partners were satisfied with the results. To what extent the business partners used the results after attending the module could not be answered by the interviewees.

The interviewees also had a strong focus on sustainability before attending the module. Their attitude has not changed fundamentally. However, they became more aware of the challenges associated with sustainability-oriented start-ups. At the moment, the interviewees cannot imagine setting up their own start-up.

Impacts

Overall, the business ideas would contribute positively to the SDGs. Since the students did not follow the further development of the business partners, they cannot provide specific insights about their current impact.

3.2.3   Student survey: Motivation, experiences and observed impacts

Characterization of the responding students

Fourteen out of 50 students responded to the survey (corresponding to a response rate of 28%), most of them participated in the module in 2018 (8 students), followed by 2017 (5) and 2016 (1). A majority of the students (9 out of 14) studied the Master in Sustainability Economics and Management, one student the

Master in Business Administration, Economics and Law and four of the students did not list a program.

Motivation and interest

When the students ranked the motivation to participate in the module (Figure 4) reasons that for the majority were considered extremely important or very important were the possibility to collaborate with companies, to develop new competences, the combination of sustainability and entrepreneurship and to experience a different teaching set-up. One student further highlighted the possibility to collaborate with different companies, ideally young start-ups or small companies and specified the interest in collecting new experience in sustainability consulting. For very few the module being compulsory was addressed to be somewhat important. Additional motivation highlighted as other reasons were the idea of getting encouragement to set up a business in the field of sustainability.
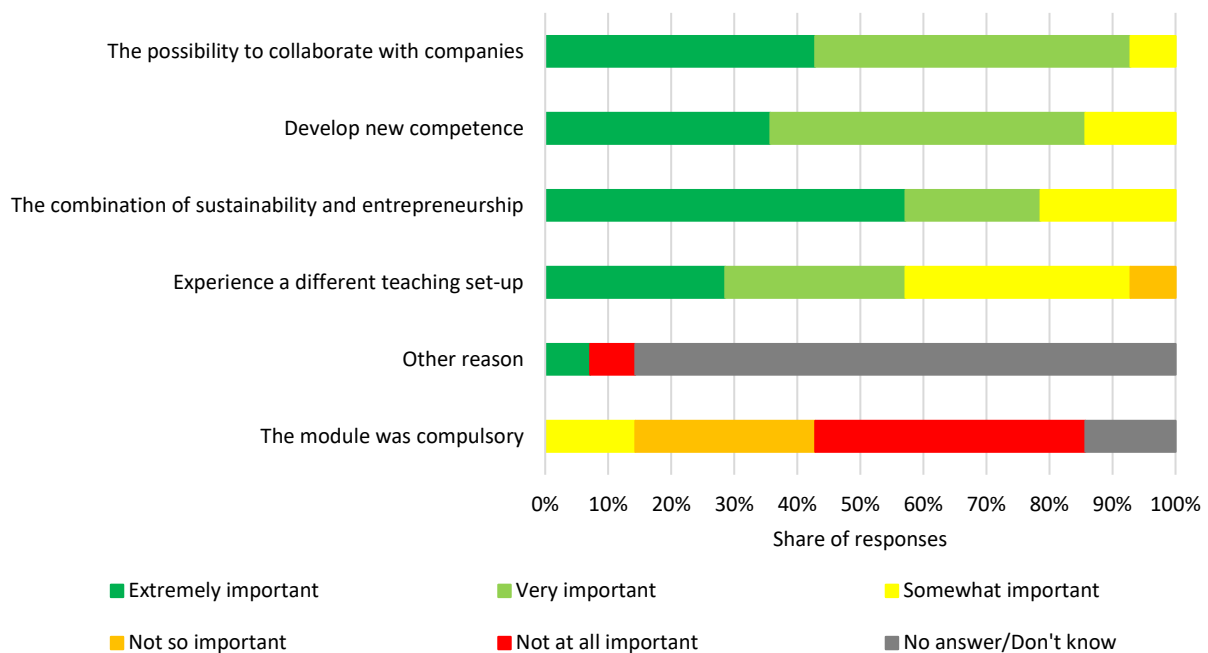
Figure 4: Compilation of the results from Q3 Why did you participate in the module?

In the survey we asked the students to assess their interest before and after the module for the following topics; Sustainability, Entrepreneurship, Innovation and Sustainable Entrepreneurship (Figure 5). A majority of the students considered themselves to be extremely interested in sustainability from the beginning and only two students changed their interest during the module. All of the students had some kind of interest in entrepreneurship before the module, an interest that was unchanged or increased during the module (4 students). The interest in innovation before the module was slightly lower compared to that for entrepreneurship, however, half of the students had increased their interest in innovation after the module. For the combination sustainable entrepreneurship, a large interest was observed from the start and the interest was further increased for five students; the rest unchanged.
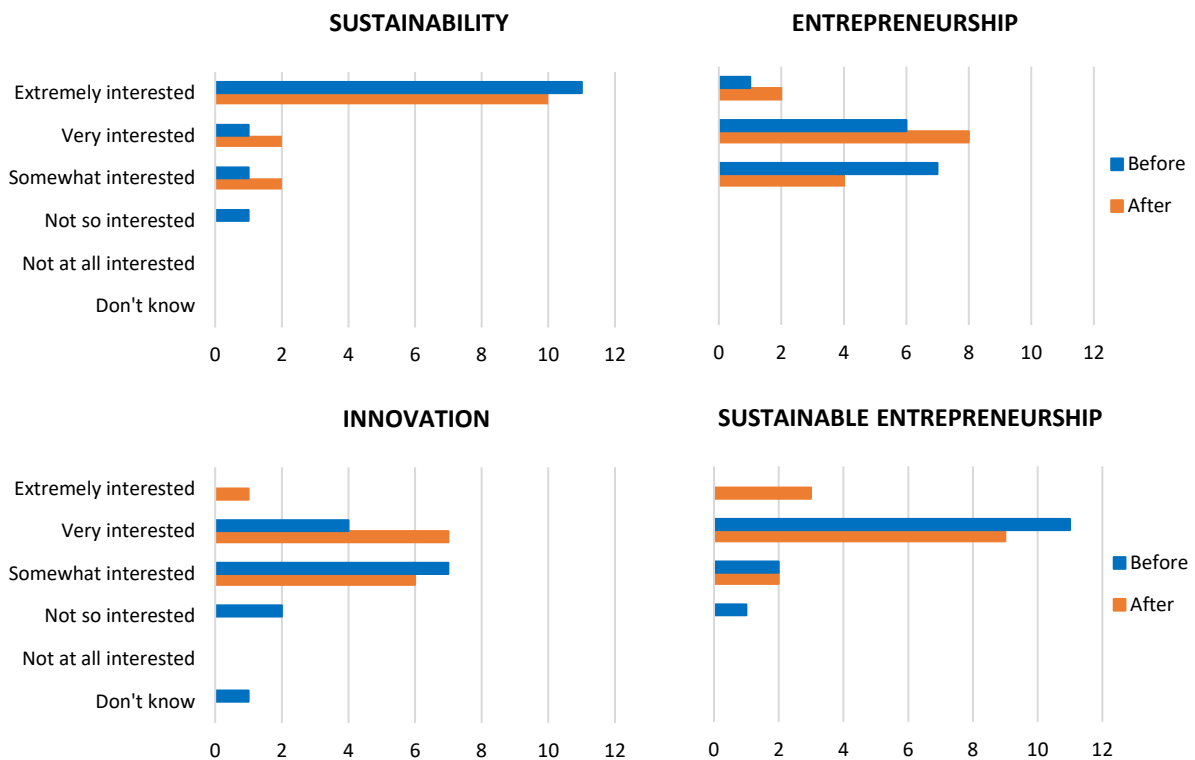
Figure 5: Compilation of the results from Q4-11 about interest in Sustainability, Entrepreneurship, Innovation and Sustainable Entrepreneurship before and after the module

(x-axis show number of responses)

Background to project work on developing business ideas

During the module the students performed project work in groups of 3-5 students (Figure Annex B in Annex 10). Regarding the diversity within the project groups (Figure Annex A in Annex 10) half of the students responded that their group had no diversity as all students where from the same program. Only two students considered the group to have a lot of diversity and the rest moderate or little.

Assessing the module

To highlight the strengths and weaknesses of the module a list of statements was presented for the students to assess (Figure 6). A statement is considered a strength if >50% of the students have responded extremely/very/somewhat high. Whereas if <50% it is considered a weakness and that there is room for improvement.

More than 90% of the students considered the module to have extremely or very high practical relevance and it was also considered to give the possibility to think freely and differently. Around 80% of the students considered the synergies from teamwork, the connection between tools/methods and the project task as wells as the commitment of the teachers to be extremely, very or somewhat high. The connection between module content and exam (Prüfungsleistung) were considered high by a large majority of the students whereas that between lectures and project work were considered lower (still >50% very/somewhat high).

Room for improvements (weaknesses) are identified as related to the involvement of guest lectures and to the connection between module credits and workload.
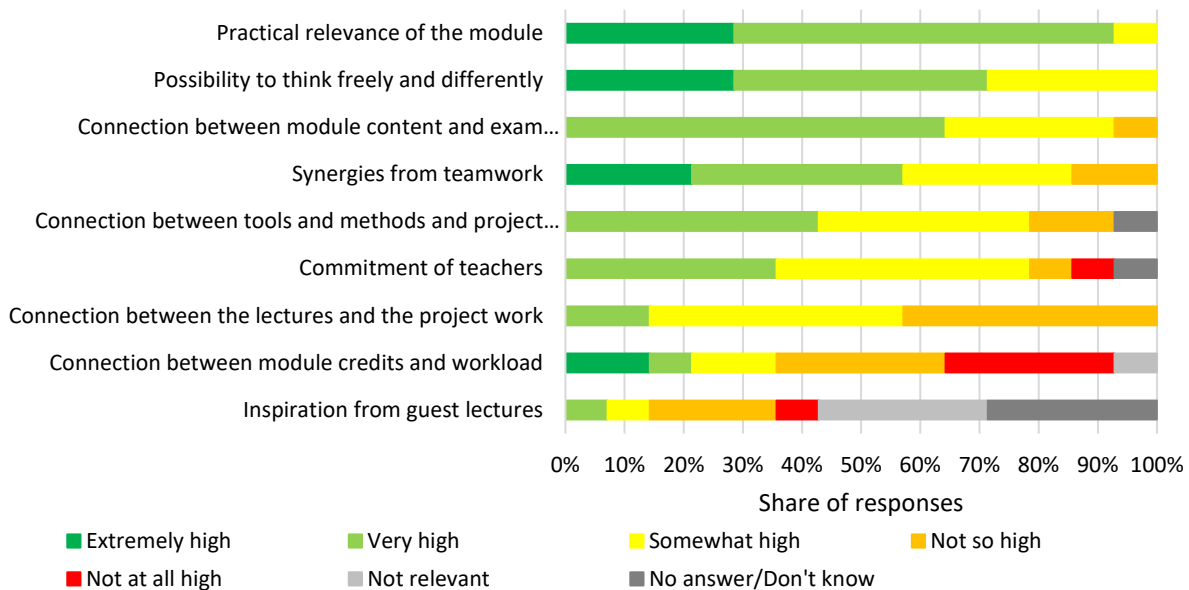
Figure 6: Compilation of the results from Q14 Respond to the following statements in connection to the module (strengths and weaknesses)

As addressed above the majority of the students considered the connection between tools/methods and the project task to be very high or somewhat high. When asked to list the most helpful methods and tools 15 of the prelisted were chosen and *Competitive analysis* were added by one student and ranked as most useful (Figure 7). Six different methods/tools were ranked as the most useful and most frequent are the *Business Model Canvas* whish also was listed the highest number of times compiling all the ranking levels.
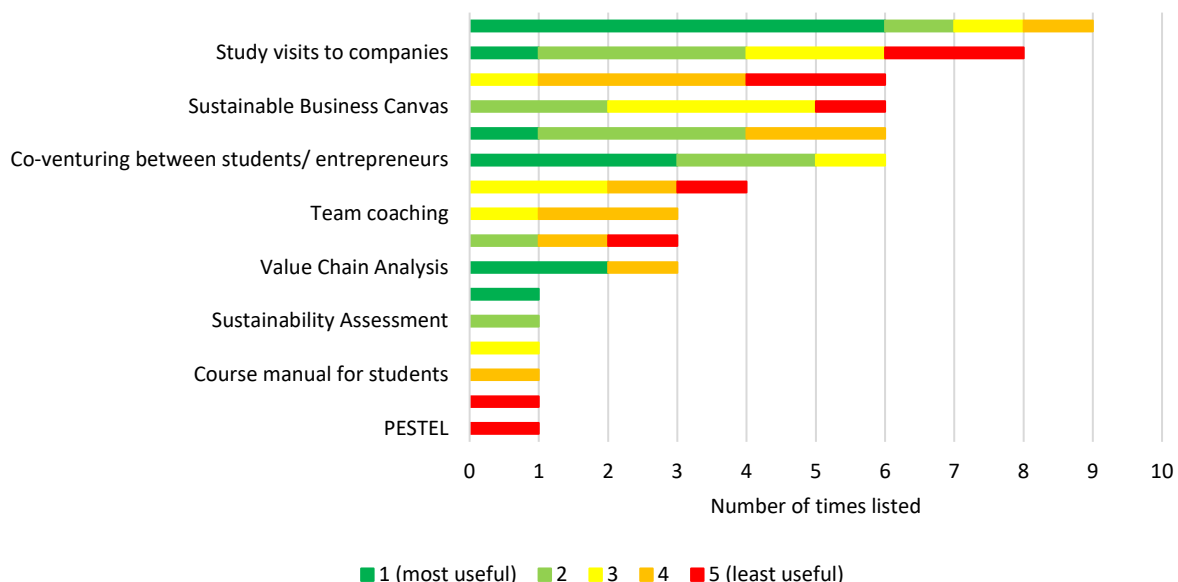
Figure 7: Compilation of the results from Q15 Which were the most helpful methods and tools that you used in the module? Rank up to five methods from 1 (most useful) to 5 (least useful).

Outcomes

When addressing the outcomes of the module a majority of the students listed increased personal competence and an improved business model (Figure Annex C in Annex 10). One student answered a new business idea as well as the launch of a start-up. Another student wrote his/her thesis in cooperation with a business partner and were employed, in total two students listed employment at business partner as outcome. One student chose to also add another outcome and specified it as "The knowledge that it is difficult to set sustainability at first priority and be profitable".

The students were further asked about the importance of the module for the progress of their study as well as their job choice and career (**Fehler! Verweisquelle konnte nicht gefunden werden.**). A majority of the students (9 out of 14) considered the module to be important for the progress of their study as well as for their job choice and career (8 out of 14).

When instead considering the outcomes in relation to the business partner (Figure Annex DFigure Annex D in Annex 10) 11 out of 14 considered the outcome to be very or somewhat important for the business partner.
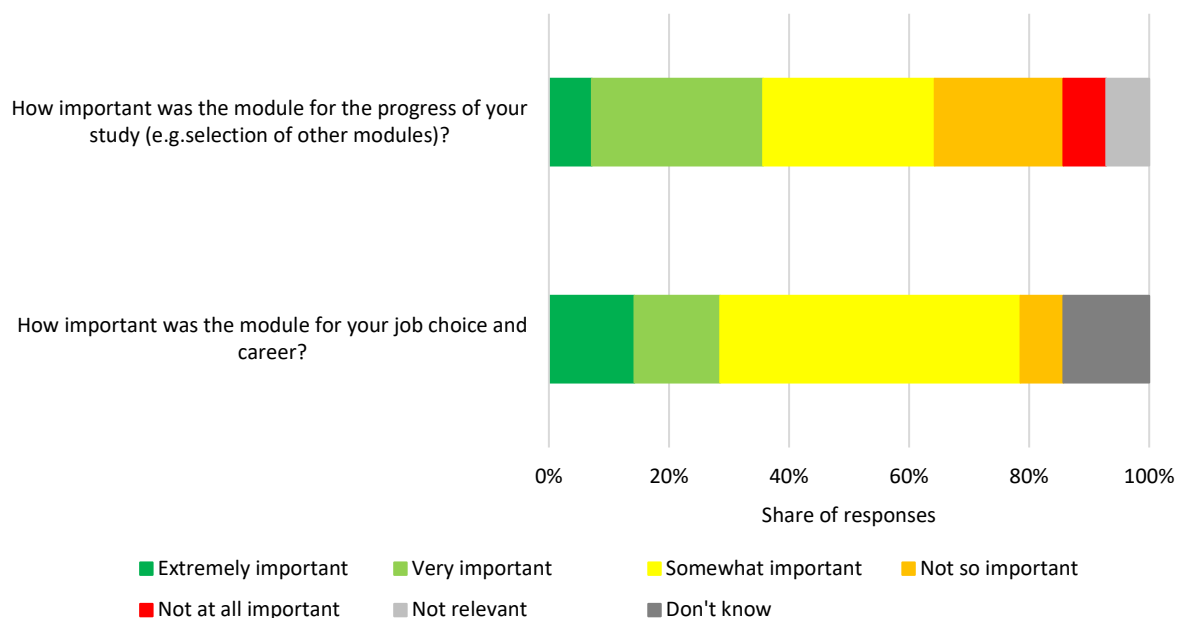
Figure 8: Compilation of the results from Q17 How important was the module for the progress of your study (e.g. selection of other modules)? and Q18 How important was the module for your job choice and career?

Impacts

The (potential) impact of the projects were valued slightly different depending on if social, environmental or economic benefits were considered (Figure 9). The ratio of significant and major impacts was higher for environmental benefits compared to social and economic benefits. Less than 15% of the responses

considered the impacts as insignificant.
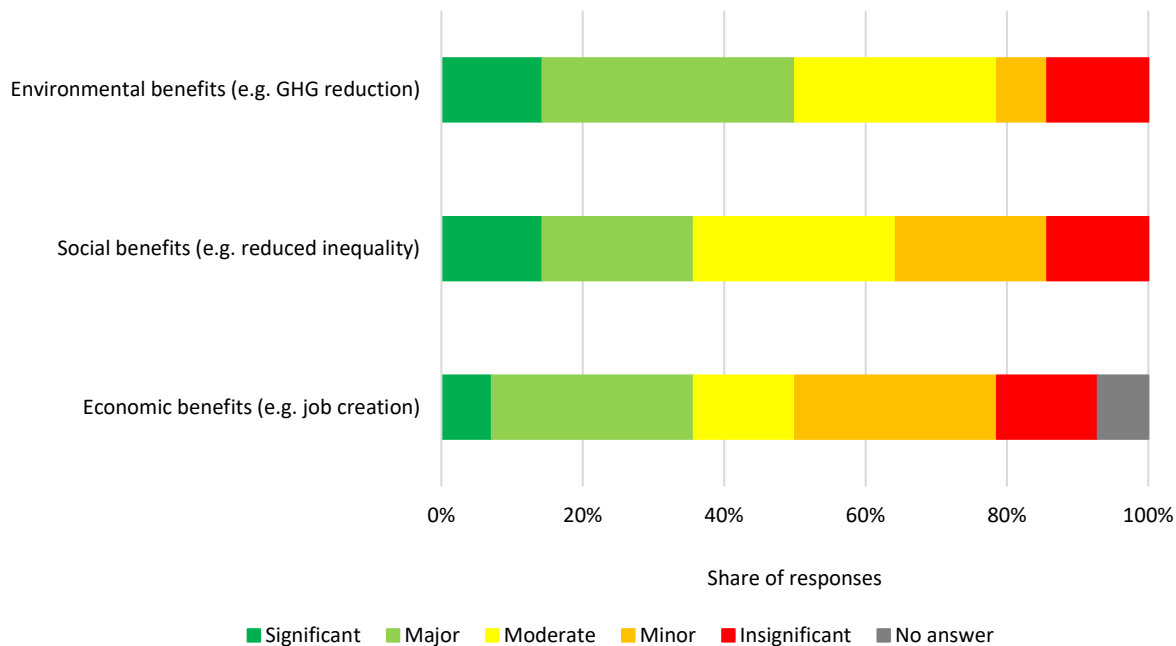
Figure 9: Compilation of the results from Q20 What was the (potential) impact of your project on society or the natural environment?

Suggested improvements

Finally, the students were given the opportunity to give suggestions on how to improve the module, an opportunity that was taken by 10 of the 14 students.

Suggestions regarding the involvement of business partners were to give a more official presentation of results for business partners, to invite more guest lectures/entrepreneurs and to give the opportunity to cooperate with more than one business partner. An increased engagement by the business partners were requested and increased help from teachers to handle lacking commitment from the business partner.

Improvements regarding communication and feedback were also suggested in terms of:

- Formulate more clear expectations as well as being more detailed in evaluation and providing feedback.
- More time for feedback from both teachers and students.
- Equal supervision and evaluation.
- Better communication between teachers.

It was also suggested to allocate more time for input and practice of the tools and to expand the module in time to distribute the workload which was considered high by several of the students.

See Annex 10, Table Annex A for the full list of suggestions.

3.2.4 Business partners: Experiences and observed impacts

Characterization of the interview partners

Both interview partners work in a start-up. One interviewee is also one of the founders of the start-up and the other one is responsible for the product and business development. Sustainability is very important for the respective business models, because the business ideas started with finding solutions in the context of sustainability. One start-up develops new products from fibers that can be used as plastic

substitutes and the other one is specialized in the development of technologies and software for waste management. Therefore, the interview partners have a strong connection to topics such as innovation, sustainability and entrepreneurship.

Motivation and interest

The start-ups consist of young teams and most of the team members have an academic background. They participated in the project for two reasons. On the one hand, resources are limited and student support is appreciated. On the other hand, the start-ups can assess the competences of students on the basis of their own academic experiences and they are hoping for new and fresh ideas through the cooperation. The exchange to reflect on strategies and ideas was an essential reason for participation. For one respondent, the reason for participation was more in a long-term strategic interest, as the discussed topic currently does not have the highest priority for their core business, but it is of great relevance in case of successful business development.

The Activities

The interview partners could not remember the exact project tasks immediately. In progress of the interview they were able to remember the relevant topics. The task covered, for example, market analyses or the development of a potential expansion strategy. The business partners rate the motivation of and the communication with the students very positively.

Support of lecturers

From the business partners' point of view the module was well organized. During the module the business partners were especially in contact with the students. A contact to the lecturers primarily existed before the beginning of the module, during the kick-off event and at the final presentation. As a result, it is difficult for the business partners to evaluate the support provided by the lecturers.

Biggest challenge

Form the viewpoint of the interview partners it is a challenge to develop a concrete and solvable task for the student teams. The students are not experts for the respective company related task. Thus, there is the danger that the task is very broad and general or that the business partner has to prepare a lot of information for the students and thereby already develops the solution on its own. It is also hard for students to make the right assumptions and the right restrictions that fit in with the company's idea.

Assessing the module

The student teams were highly motivated and according to one business partner they even worked like a new team in the start-up. There was a great degree of openness also by the lecturers. So that the students could really develop their very own concepts with the help of the provided tools and concepts.

Outputs and outcomes

The Business partners were very satisfied with the results of the student projects. In some cases, contact was maintained even after the end of the module. One student wrote a master-thesis in cooperation with the start-ups and is now working in the start-up.

Impacts

The business partners mentioned that it is difficult to assess the impact of the module. Since both business partners have a clear sustainability focus, the project outcomes would also indirectly contribute to the

SDGs.

3.2.5 Teaching team: Experiences and observed impacts

Characterization of the interview partners

The interview partners were Professor entrepreneurship, and a research assistant. For both, entrepreneurship plays a central role in their professional life, while sustainability is less influence in their professional life, but very important in their private life.

Motivation and interest

The role of the respondents varied: one took the initiative to setup the Eco-Venturing module and is as leader of the program responsible for the educational module. The basic motivation to start the module is to bring students and business in contact with each other. Many companies have ideas but not the time and capacity to analyze. Student ideas sometimes are not realistic, but they have analytical tools.

The Activities

The most important methods and tools are related to business models, e.g. the Business Model Canvas, value chains, idea generation, and design thinking. Only a limited time is available to introduce tools to the students. Therefore, the teaching staff only briefly introduce available tools. Students have to find appropriate tools in a toolbox online. Due to a huge variety in assignments, the tasks of the students are very different and consequently, the required tools differ.

Role of lecturers

The respondents organize, teach, and use their networks. In addition, the respondents, assess the students, grade and evaluate the student performance.

Biggest challenge

Only in the beginning, it was a challenge is to find the right partners. A challenge is to deliver a lot of content in a limited time. Time management for the students is an issue. Another challenge is to find solutions or strategies that are really helpful for the companies. Several demands have to be satisfied: demands of teachers, who want to have sound analyses, and the business partners, who want to have practical solutions.

Assessing the module

The strength of the module is to combine fresh and new views of students with the experiences of established or newly founded businesses. Students like the module, they like to implement their knowledge in practice situations: it is popular among students. A weakness is the limited time available: the module is just one term. Therefore, not enough time is available to deliver all knowledge to the students and businesses. A duration of two terms (one year) would be more appropriate, however difficult to organize. Another weakness is the fact that the module has a part time character: students also have to attend other study programs at the same times and cannot spend enough time to the Eco-Venturing module. Every year, the model is improved based on feedback. Three improvements are mentioned by the respondents: (1) to increase the timeframe; (2) improved university-support: involvement of university technology transfer office (TTO); (3) to obtain more funding because funding is still a problem for start-ups in the Oldenburg area; (4) clearer communication between all stakeholders: teachers, students and companies. The Eco-Venturing module can be scaled because the network of business partners is very good scalable. However, upscaling is dependent upon prior adjustment of the administrative systems, procedures and resources. If these items are not improved, it is too much work to support all students and to manage the module. Scalability is easier when to a large extent online E-learning can be used. With a network of Universities, which is built in the S4S project, even a bigger choice and more matching opportunities between students and companies can be created. Companies deliver the business ideas and

cases.

Outputs and outcomes

The main results are to get experience in self-organizing as a team, in project management, to gain business experience, to improve presenting, and defending ideas analytically. Students learn to process not well-structured input from business partners. Students experience what is possible in real situations. Students gain self-confidence because they solved a real problem, they feel responsible for solving the problems. A result is also the change of career perspective: students might consider becoming an entrepreneur themselves. A result for companies is to step out of the daily business and to consider innovation in a more general way and get fresh ideas. The companies are pretty satisfied because they get a lot of new ideas for their business or solved their problems. The eco-venturing module is for businesses as useful as it is for students because it starts discussions about innovation and sustainability in the company and accelerates innovations. The Eco-Venturing model changes the attitude of the students; they become more interested in entrepreneurship, understand the complexity of sustainability and become aware of the tensions between sustainability and entrepreneurship. Sustainable projects are not always easy to implement. Students can contribute a lot because not so much is known yet. Sustainable innovation at companies is less advanced than expected.

Impacts

Students develop skills they would not have developed otherwise and increase their networks of students amongst each other arise as well as networks between students and companies. Students become more aware, but also more critical: even 'sustainable' companies face difficulty in implementing sustainability. Students sometimes become a bit disappointed because in real life it is not as sustainable as they had expected it to be. Sometimes, a project starts with a sustainability problem and pivots into a marketing problem. Sometimes, sustainability is more or less window dressing.

3.2.6 Key insights and learnings

In the following, we summarize the key insights gained from our student survey and interviews with lecturers and students.

3.2.6.1 Motivation and interests of participants

The student teams were highly motivated. Before the eco-venturing module, students had experience and interest in sustainable projects. In fact, the sustainability experience

exceeded entrepreneurial or innovation experience. The students were motivated by earlier classes regarding Sustainability Economics and wanted to gain experience in starting new ventures or in sustainability consulting.

The motivation for the teaching staff was to bring students and businesses in contact with each other because they supplement each-other: businesses supply interesting business cases in exchange for sound analyses, new scientific insights, and fresh ideas of students.

The motivation of the business partners was twofold: to obtain additional student support (due to limited resources) and to get new and fresh ideas.

3.2.6.2 Key persons and promoters

All three students interviewed had a connection to sustainability, either by sustainable modules and/or by sustainable lifestyles.

The interviews with the teaching staffer were made with a Professor entrepreneurship, who took the initiative to setup the Eco-Venturing module, and a research assistant. Both had experience with entrepreneurship and affinity with sustainability.

Both business interviews have been made with start-up companies for whom innovation, sustainability and entrepreneurship is considered to be very important.

3.2.6.3 Drivers, barriers and success factors

The strength of the module is to combine fresh and new views of students with the experiences of established or newly founded businesses. Because of its practical content, the module is popular amongst students.

A barrier is the workload. The workload of the module was difficult to estimate for students. In effect, it was much higher than expected. Therefore, time and project management is a crucial success factor in the Eco-Venturing module. Time management for the students is an issue because of fulfilling ambiguous and demanding and ambiguous tasks in a limited time.

The workload was considered too high within the given timeframe of one semester and too high for the number of ECTS credits given. Expanding the projects beyond one semester would solve this problem, but is considered to be problematic due to organizational reasons.

It is a challenge for businesses to formulate concrete doable assignments for the student teams. During the course, some assignments evolve; e.g. - a project might start as a sustainability issue and ends as a marketing issue.

3.2.6.4 Unique elements

A strength of the Eco-venturing module is the practical character and the high level of theory/practice transfer. Students gain hands-on start-up experience at real companies, and practice with developing new sustainable business ideas and presenting these ideas to the businesses.

3.2.6.5 Strengths and weaknesses and need for improvement

There was a great degree of openness between companies, lecturers, and students. Students could really develop their very own concepts with the help of the provided tools and concepts.

The following suggestions for improvement have been mentioned by the respondents:

(1) To formulate clearer expectations of the module;

(2) to allocate more time for input and practice of the tools and to expand the module in time to distribute the workload which was considered high by several of the students;

(3) to increase the timeframe;

(4) clearer communication between all stakeholders: teachers, students and companies and more co-ordination between teaching staff;

(5) To increase diversity in the student teams good mix of students with different disciplinary backgrounds;

(6) to invite guest lectures and to the connection between module credits and workload

(7) improved university-support: involvement of university technology transfer office (TTO);

(8) to obtain more funding because funding is still a problem for start-ups in the Oldenburg area.

3.2.6.6 Transferability and scalability

There is an ambition to up-scale the program. The Eco-Venturing module could be scaled because of the extent of the network of business partners is very good scalable. However, upscaling is dependent upon

prior adjustment of the administrative systems, procedures and resources. In addition, the limited time availability of the teaching staff is a bottleneck for upscaling the program. If these items are not alleviated, larger numbers of students or business projects could not be facilitated.

Scalability could be enabled when to a large extent online E-learning content could be used. The increasing network of Universities, which is built in the S4S project, increases the chances of upscaling. In that case, more matching opportunities between students and companies can be created.

3.2.6.7   Outcomes and impacts

The eco-venturing module is for businesses as useful as it is for students because it starts discussions about innovation and sustainability in the company and accelerates innovations.

The Business partners were very satisfied with the results of the student projects because they get a lot of new ideas for their business or new possible solutions their problems. Companies consider it difficult to assess the impact of the module on the longer term. Consequently, they are uncertain whether the business ideas would contribute positively to the SDGs.

The students increased their personal competences and gained experience in developing new business models. They improved their presenting skills, and learned to develop ideas analytically and defend these at businesses, who want practical solutions. The students consider the module to be important for the progress of their study as well as for their job choice and career perspectives. Students learn to process not well-structured input from business partners. Students experience what is possible in real situations. Students gain self-confidence because they solved a real problem, they feel responsible for solving the problems

The interest in entrepreneurship and innovation did not change for some students, for others it did. The substantial initial interest in sustainable entrepreneurship even grew for some students.

The attitude of the students towards sustainable venturing has not changed fundamentally. However, they became more aware of the challenges associated with sustainability-oriented start-ups and become more interested in entrepreneurship. They understand the complexity of sustainability and become aware of the tensions between sustainability and entrepreneurship.

Students develop skills they would not have developed otherwise and increase their networks of students amongst each other arise as well as networks between students and companies. Students consider the impacts of the Eco-Venturing module higher for environmental than to social or economic aspects.

3.2.7   Conclusion

In total 154 students at Master level participated in 49 business projects of 49 business partners. The Eco-Venturing Module can be considered as successful: companies, students and staff are highly satisfied. In the module, several demands have to be met: requirements of teachers (proper analyses), business part-ners (practical solutions), and students (new experiences). Therefore, it is recommended to explore the research questions in advance more closely in order to concretize expectations for all, and communicate this in advance with the businesses involved, the students and the teaching staff.

There is an ambition to upscale the Eco-Venturing module. Enough company projects could be obtained. Upscaling is only possible if and when adjustments are made: higher use of remote learning (MOOCs), additional staff, and more flexible systems.

3.3   CASE STUDY EVALUATION REPORT 2: ENVIRONMENTALLY DRIVEN BUSINESS DE-VELOPMENT (SWEDEN)

3.3.1   Fact sheet

Factsheet Student/Business cooperation in green venturing S4S

Status: 11 March 2019

Module **in general**

Title of module	Environmentally Driven Business Development
Initiating university	Linköping University
Start year	2013
End year / ongoing	Ongoing
No. of modules held	6
Duration (weeks)	20
ECTS:	6
Module objective(s)	The course aim is to develop the capabilities to formulate and plan a business solution for an environmental problem. After completion the student shall be able to: • Explain and reflect upon relevant theories and concepts in the area of sustainable entrepreneurship • Account for drivers and hinders for environmentally driven business development • Account for critical factors for the establishment of an entrepreneurial venture and have some ability to collect and analyze relevant information for that purpose • Combine knowledge about environment and environmental technology with innovation and entrepreneurship • In a group design, describe and motivate a tentative business solution to an environmental problem.
Phases & activities (in key-words only)	Theories and practical examples are presented at lectures. Seminars are arranged for further supporting the learning. In a group assignment a sustainable business idea is planned and described.
No. of business projects so far	1 directly.

No. of business partners so far	5 as inspirators.
No. of students so far	130

Balance involvement between Business / Student:

Student involvement per module

(Characteristics of students typically included in the module)

No. of students	15 to 30
Level of students	Bachelor level Master level PhD level ☐ ☒ ☐
Background students	Technical; Managerial; Environmental; Other ☐ ☒ ☒ ☐
No. of universities/ professor-ships involved	2 professors (divisions)
Number of Faculties involved	1

Business involvement per module

(Characteristics of business partners typically included in the module)

No. of companies/ venture teams/ start-up teams	1 Pre-seed, venture team, no sales, industry (energy) 2 student start-ups (active students in the module). One pre-seed and one 1st Stage. Both were venture teams. Sales were none for the pre-seed and small for the 1st Stage. One in industry (agriculture) one in services (environmental management).
Age of business partners	not applicable
Size of companies FTE (no. of companies)	not applicable
Size of companies sales (no. of companies)	not applicable
Typical Branches (no. of companies)	not applicable

Sustainability items covered

People issues (social)	Yes/no Partly but not core.
Planet issues (sustainable)	Yes Core
Profit issues (business)	Yes Core
keywords of sustainable subjects covered (max 10)	Energy, sustainable consumption, recycling, energy and environmental management (tools, digitalization), waste as a resource, waste prevention, circular solutions

Personal assessment (qualitative)

Which activities & methods have been effective:	Which improvements could be made:
1. Student focused workshops backed up with lectures. 2. Digitalization of some lectures and course management. 3. Inspirational and creativity workshops. 4. Final presentation as an exhibition.	1. Adjust to more diverse group of students with different engineering backgrounds. 2. Increasing the focus on environmentally driven business development to differentiate from similar modules. 3. Improve feedback on drafts of student reports. 4. Perhaps take one step back regarding flipped classroom pedagogics. 5. Opening for more external projects (now mainly based on student ideas).
Main outcomes of the module	Approximately 20 business plans. Two student start-ups developing their own ideas in the module. One university start-up helped in drafting their first business plan.

3.3.2 Explorative interviews with students

Characterization of the interview partners

One interviewee is currently working as an energy engineer, one interviewee is a student and one has just graduated. The interviewees are either still studying or have already obtained a master's degree in engineering or in industrial engineering and management. The respondents attend the in autumn 2017 or 2018. All interview partners expressed a high level of interest in sustainability even before taking part in the module. This can be illustrated, for example, by the focus of their curriculum, their student engagement and also in some cases by their professional experience. The interviewees are only partially interested in founding a company.

Motivation and interest

The module was optional for all respondents. The combination of sustainability and business model development was a major reason for participating in the module. Also "this module was the one that best matched the schedule" was mentioned as a reason. In some cases there were no specific expectations

before the module started. All interview partners were already interested in innovation topics and entrepreneurship before attending the module. However, not all respondents can imagine to work in this area later. All interviewees were already interested in sustainability-oriented business models due to their previous courses of study. Previous experiences in the field of innovation refer in particular to other courses. One interviewee gained initial experience in the area of entrepreneurship before attending the module. All interviewees had experiences in the field of sustainability. One reason for this is the structure of the entire curriculum.

The Activities

The project ideas referred, for example, to a business model related to an app that provides sustainable recipes or the provision of a reusable freight box or an IT platform that would help companies to identify their key environmental impacts. The main focus of the module was on the learning process with regard to business model development. As a result, in most cases the project ideas were not implemented, because implementation is not a key objective of the module. Various methods and tools were used in the module: brainstorming, shitty prototyping, risk analysis, market analysis, resource analysis, business plan development, cost-benefit analysis, Lego-Serious-Play, SWOT analysis, Business Model Canvas, NABC, PESTEL.

No business partner was directly involved in the module. However, companies were contacted e.g. for market analyses. In one project group, two team members had their own company and checked to what extent they could use the project idea for their company. Each project group consisted of 4-6 students.

Support of lecturers

The lecturers acted more like coaches, which was positively received by the interviewees. Lecturers with different professional backgrounds contributed to the heterogeneity of the module.

Biggest challenge

The identification of a feasible business idea was seen as a challenge by one interviewee. The development of a business model was also a challenging task.

Assessing the module

The interviewees rated the independent working style and the practical relevance positively. The involvement of guest lecturers also contributes to the positive evaluation of the module. The clear structure of the module with different focuses was also highlighted.

The number of possible methods contributed partly to a lack of orientation. From the students' point of view, the final examination does not fit to the overall structure of the module.

In the future, more sustainability-related tools and methods could be integrated in the module. The competencies in the individual project teams could also be matched. In the future, students from other disciplines may also be invited to participate in the module. In addition, the module could also be extended by a component focusing on practical implementation.

From the point of view of the interview partners, the module could also be transferred to other universities.

Outputs and outcomes

The learning process within the framework of business model development was mentioned as a key result, since the business models which had been developed were not implemented. The knowledge acquisition and the application of new tools and methods were also mentioned as learning outcomes.

The attitude of the respondents towards innovation topics has not changed fundamentally. However, all interviewees became aware of the challenges associated with sustainability-oriented business model development and green venturing. The interviewees have not yet identified any direct impact on their own career development.

Impacts

The project ideas were not implemented. Therefore, the potential impact can only be estimated. If implemented, the project ideas could contribute to the SDGs in the long term.

3.3.3 Student survey: Motivation, experiences and observed impacts

Characterization of the responding students

Twenty-five out of 75 students responded to the survey (corresponding to a response rate of 33%), most of them participated in the module in 2018 (13 students), followed by 2017 (7) and 2016 (5). A majority of the students (18 out of 25) studied the Master of Science in Energy - Environment – Management, and the rest (7 out of 25) studied the Master of Science in Industrial Engineering and Management.

Motivation and interest

When the students ranked the motivation to participate in the module (Figure 10), reasons that for the majority were considered extremely important or very important were the combination of sustainability and entrepreneurship, to develop new competences and the fact that the module was compulsory for many of the students. In addition to the prelisted reasons two students further highlighted it as the possibility to learn how to develop sustainable business models. Additional motivation highlighted as other reasons were the inclusion of a group activity and that the module was cross-disciplinary with students from different programmes.
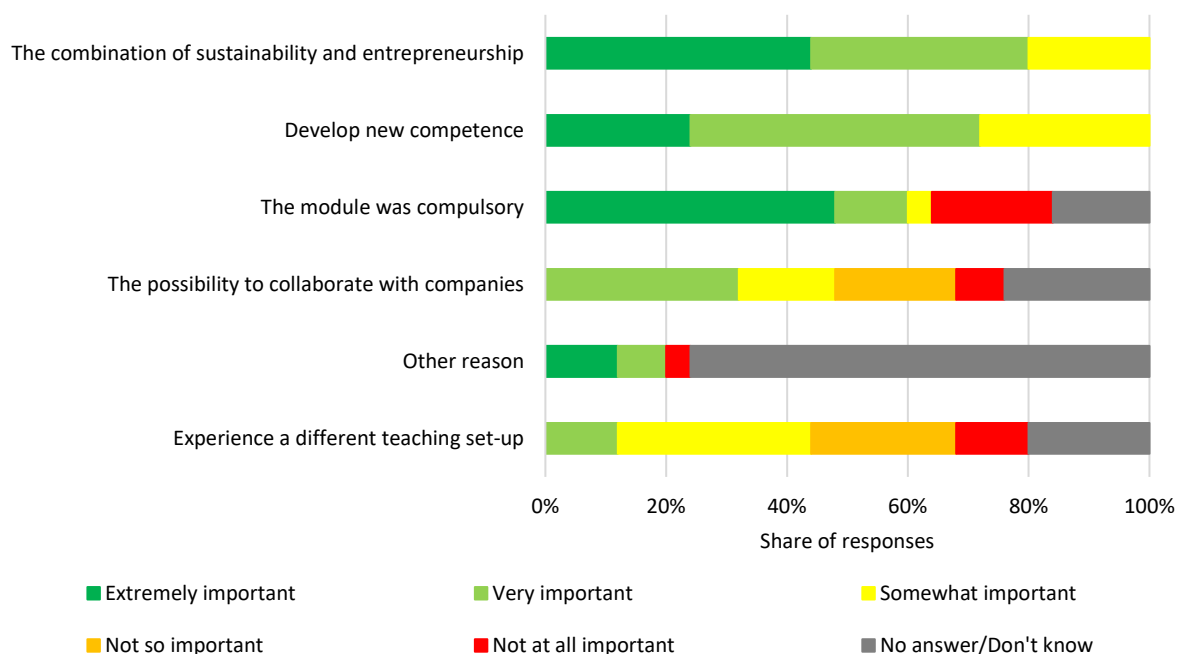
Figure 10: Compilation of the results from Q3 Why did you participate in the module?

In the survey the students were asked to assess their interest before and after the module for the following topics; Sustainability, Entrepreneurship, Innovation and Sustainable Entrepreneurship (Figure 11). All the students considered themselves to be extremely or very interested in sustainability from the beginning, an interest which stayed unchanged after the module. All of the students had some kind of interest in entrepreneurship before the module, yet two of them with a low interest. The interest in entrepreneurship grew for seven of the students whereas it decreased for two. The interest in innovation before

the module was fairly similar compared to that for entrepreneurship, eight of the students had increased their interest in innovation after the module. The interest for sustainable entrepreneurship was slightly
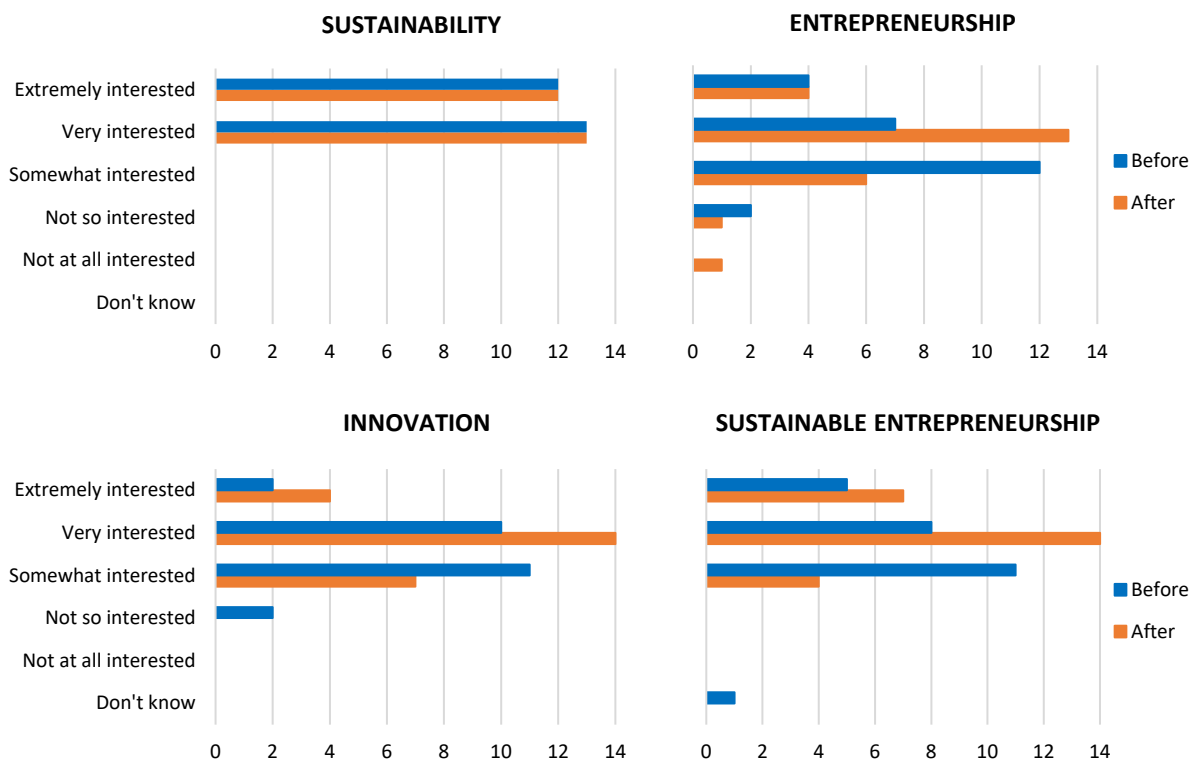
Figure 11: Compilation of the results from Q4-11 about interest in Sustainability, Entrepreneurship, Innovation and Sustainable Entrepreneurship before and after the module (x-axis show number of responses)

higher than for entrepreneurship alone and the interest grew for ten of the students; the rest unchanged.

Background to project work on developing business ideas

During the module the students performed project work in groups of 4-6 students (Figure Annex F in Annex 11). Regarding the diversity within the project groups (Figure Annex E in Annex 11) half of the students responded that their group had a moderate amount of diversity. Only one student considered the group to have a great deal of diversity and the rest little or none.

Assessing the module

To highlight the strengths and weaknesses of the module a list of statements was presented for the students to assess (Figure 12). A statement is considered a strength if >50% of the students have responded extremely/very/somewhat high. Whereas if <50% it is considered a weakness and that there is room for improvement.

The commitment of the teachers was considered to be extremely/very high by more than 90% of the students and it was also considered to give the possibility to think freely and differently. More than 90% of the students considered the connection between the project work and tools/methods as well as lectures to be extremely/very/somewhat high and the majority considered the teamwork to give synergies. Furthermore, the majority of the students considered the module to have extremely or very high practical relevance. Regarding inspiration from the invited guest lectures the almost 70% experienced it as very or somewhat high and just above 50% considered the connection between module credits and workload to be high.

Room for improvements (weaknesses) are identified as related to the connection between the module content and the written exam. It should however be noted that this exam was not mandatory for all the students responding to the survey, hence, the large ration of *Don't know* and *Not relevant*.
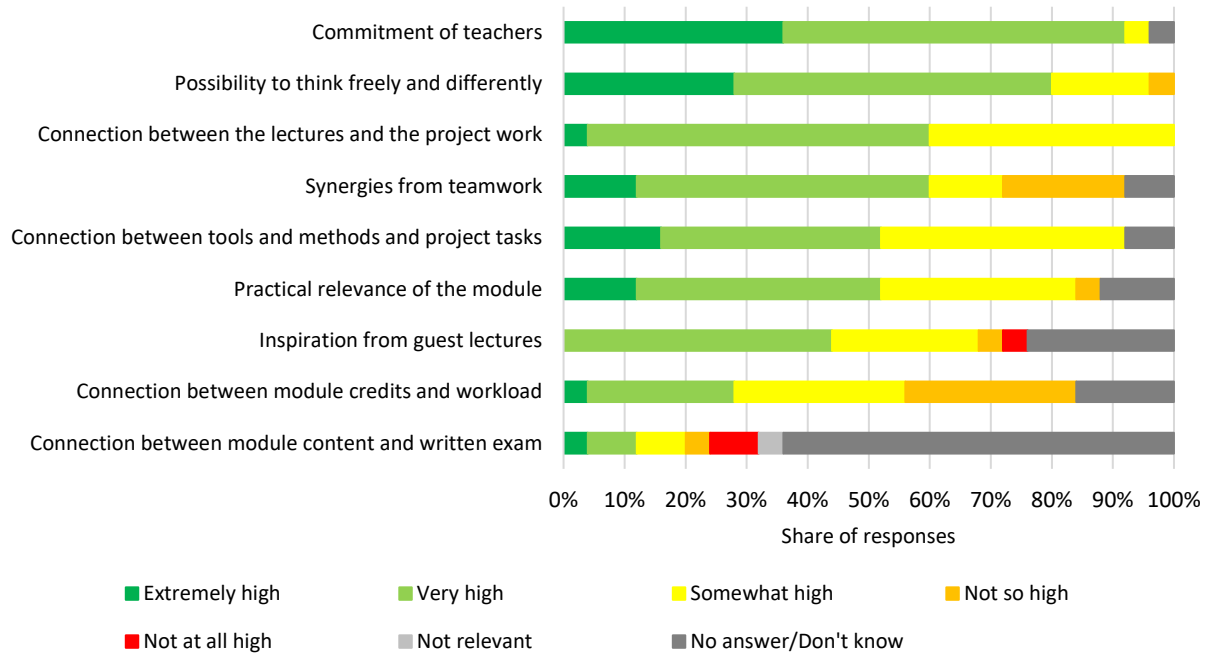
Figure 12: Compilation of the results from Q14 Respond to the following statements in connection to the module (strengths and weaknesses)

As addressed above the majority of the students considered the connection between tools/methods and the project task to be extremely, very or somewhat high. When asked to remember and list the most helpful methods and tools a total of 14 different tools/methods were listed (Figure 13), 9 of the 25 students commented that it was difficult to remember and did not list any methods/tool. Seven different methods/tools were ranked as the most useful and most frequent are the Business Model Canvas whish also was listed the highest number of times compiling all the ranking levels.
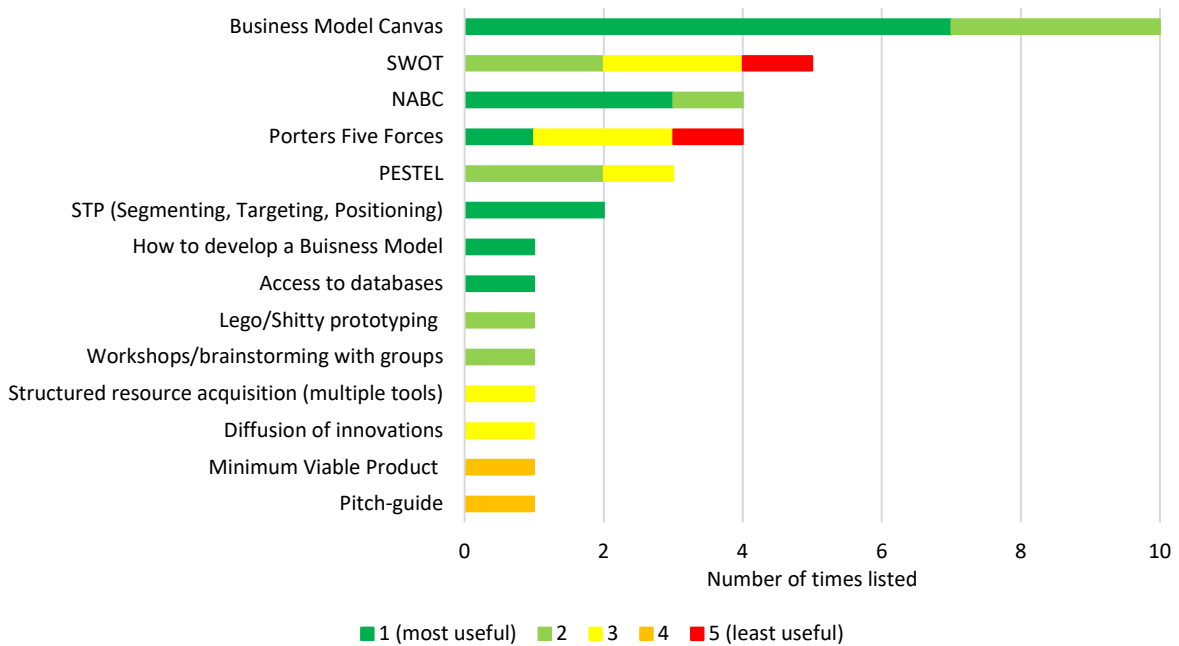
Figure 13: Compilation of the results from Q15 Which were <u>the most helpful</u> methods and tools that you used in the module? Rank up to five methods from 1 (most useful) to 5 (least useful).

Outcomes

When addressing the outcomes of the module 22 of the 25 students listed increased personal competence (Figure Annex G in Annex 11). Almost half of the students came up with a new business idea, a similar number as for new or improved business model. One student answered the launch of a start-up and another student wrote his/her thesis in cooperation with a business partner.

The students were further asked about the importance of the module for the progress of their study as well as their job choice and career and the responses for the two were rather diverse (Figure 14). Half of the students (13 out of 25) considered the module to be important for the progress of their study which also was the case for the importance regarding their job choice and career, however with a slightly differing profile.
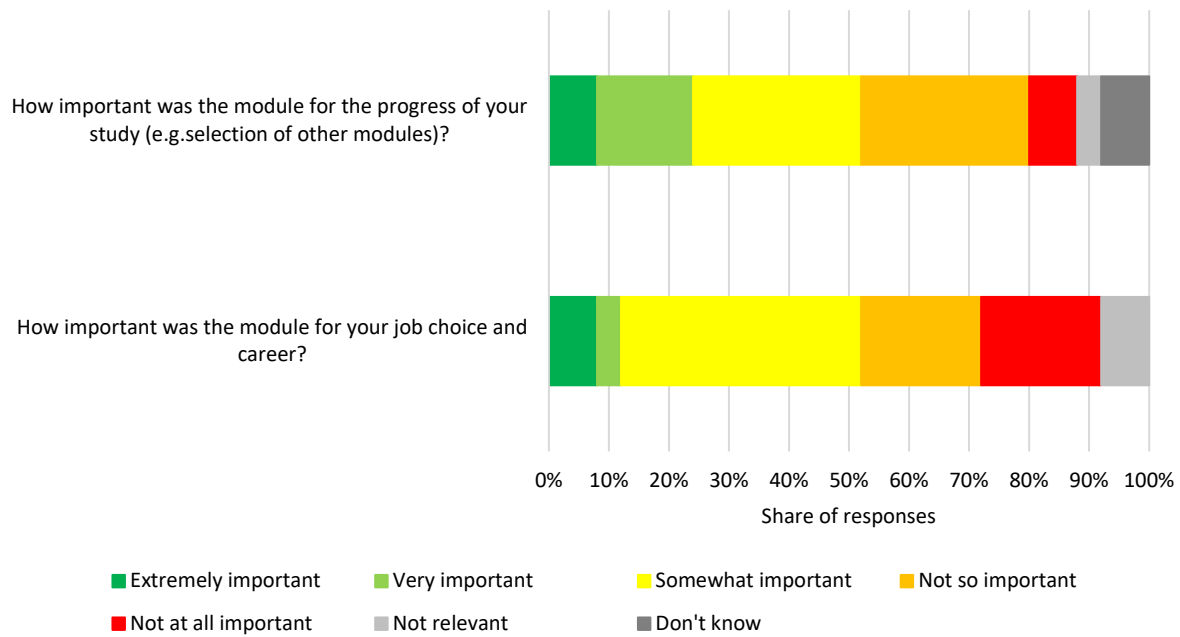
Figure 14: Compilation of the results from Q17 How important was the module for the progress of your study (e.g. selection of other modules)? and Q18 How important was the module for your job choice and career?

Impacts

The (potential) impact of the projects were valued slightly different depending on if social, environmental or economic benefits were considered (Figure 15). The ratio of significant and major impacts was higher for environmental benefits compared to economic and social benefits. Less than 10% of the responses
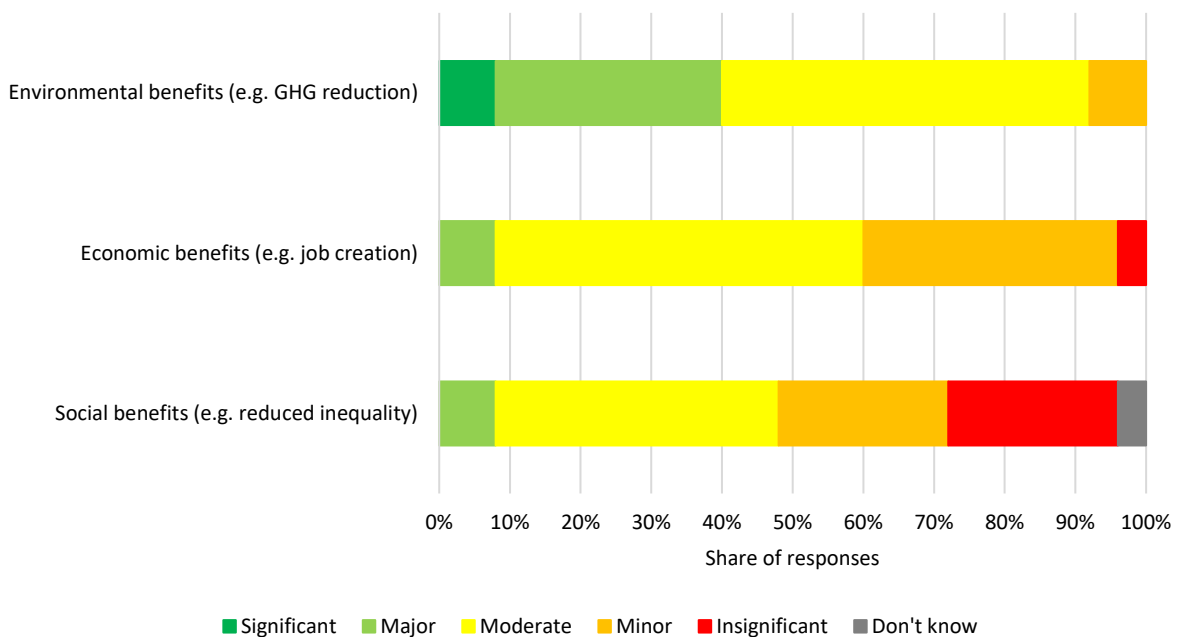
Figure 15: Compilation of the results from Q19 What was the (potential) impact of your project on society or the natural environment?

considered the impacts as insignificant.

Suggested improvements

Finally, the students were given the opportunity to give suggestions on how to improve the module, an opportunity that was taken by 18 of the 25 students.

Several suggestions were given regarding increased involvement of business partners which included more business coaching, guest lectures and to include panellists for the final presentation as well as to do projects in collaboration with companies.

The students also had suggestions on developing the content of the module:

- Put more emphasis on launching and business structure than planning.

- Helping students that want to develop their idea further, after the end of the module.

- More of analysing and redefining existing business models, not only focus on entrepreneurship and start-up.

- Make more use of the existing business support/innovation system connections to for example LEAD business incubator, and with more emphasize on NABC and market verification with NABC and then develop the value proposition BMC.

- Focus more on the "environmentally driven"-part of the business development.

- Addition of a workshop or similar being more focused on finance.

Five of the students asked for more flexibility and adaptation to their existing knowledge from earlier modules. Improvements were also suggested regarding the format asking for more cooperation and discussion between project groups during the project and a collective brain storming session where groups could share ideas. In addition, the level and format of the examination was suggested to be improved.

See Annex 11, Table Annex B for the full list of suggestions

3.3.4 Business partners: Experiences and observed impacts

Business partners have only been integrated into the module in individual cases so far. In many cases business partners have participated as guest lecturers in the module or provided their professional expertise.

That's why no interviews have been conducted with business partners within the framework of this evaluation.

3.3.5 Teaching team: Experiences and observed impacts

Characterization of the interview partners

All three interview partners are actively involved as lecturers in the Environmentally Driven Business Modul. All lecturers work at the Department of Management and Engineering at the Linköping University. The module was initiated by one interviewee and co-developed with another respondent. They have bundled their competences in the areas of environmental technologies and management, innovation, sustainability and entrepreneurship education.

Motivation and interest

The initiator of the module wanted to develop and provide a module for a new engineering program that focused on practice-oriented business model development. At the beginning it was a module about sustainability with an environmental focus and there was need for an entrepreneurial approach to sustaina-

bility. Participants should learn more about entrepreneurship and innovation in the context of sustainability challenges. Another lecturer of the module already had a lot of experience in entrepreneurship education before the launch of the module. So there was a high motivation to link sustainability and entrepreneurship topics in a new way.

The objective of the module is to familiarize students with the challenges of sustainable entrepreneurship and business model development as close to reality as possible.

The Activities

From the interviewees' point of view, the combination of expertise in environmental technology and entrepreneurship education with a high practical relevance is quite unique in comparison to other modules.

Idea generation and business model development are important elements of the module. One respondent mentioned that the module is organized like a small incubator program. Students can use a wide range of methods and tools for idea generation and business model development. From the lecturers' point of view the NABC-approach and the Business Model Canvas are important tools for the module. In their opinion there is a need for an enhanced use of sustainability-oriented tools and methods.

Sometimes business partners provide challenges as an inspiration for ideation process in the module. Business partners are not yet systematically integrated in the module, because the acquisition of partners and their support takes a lot of time. Therefore, it is important that students learn to identify and evaluate their own business ideas.

Role of lecturers

The lecturers divide the teaching in the module according to their competences. For example, one focusses on questions of entrepreneurship and the other one on sustainability issues. They act more like coaches and encourage students to work independently with the different tools and methods. This is particularly successful as the lecturers can also benefit from their own practical experience. It is also important for them that the students learn something about the theory behind the tools and methods. So that the students are able to assess the intention and relevance of the respective tool or method.

Biggest challenge

Idea generation is a big challenge in the module, because ideas have to be both realistic an innovative.

There is a need for more sustainability-oriented tools and methods. It is a challenge to identify or to develop the right approaches, because it is no sufficient to simply integrate sustainability as an add-on into the business model development process.

A further challenge is that the competences and skills of the students in the field of sustainability are quite heterogeneous in the module, because the participants come mainly from two different study programs. That's why some students have previously attended many sustainability related modules and for the other group sustainability topics on an academic level are relatively new.

Assessing the module

The lecturers believe that many students are satisfied with the module. Some students have even founded a company after graduation. Sometimes the lecturers receive the feedback that the content of the module has given an additional motivation boost for starting a business, because the module is very realistic and practical compared to other modules. So the students could use their learning experiences for their own business or for their professional experience.

The lecturers believe that the matching process for the student teams could be improved in the future. Another issue is, that sustainability-oriented tools and methods need to be better integrated into the module.

Overall, the lecturers are very satisfied with the module and think that it is scalable and can implemented at other universities as well.

Outputs and outcomes

Students should learn more about the challenges related to responsible, sustainability-oriented innovation and entrepreneurship processes. Although the output of the respective business model development process is important, especially the associated learning processes are essential outcomes of the module. The students learn how to evaluate an idea and how to classify and apply tools and methods for business model development.

In some cases, students will not use the approaches directly at the beginning of their professional career. Above all, it is important that they develop the ability to assess the usefulness of individual methods so that they can make use of them over the long run in their professional career. They learn how the process looks like, what questions they need to ask, what information they need to collect, what analyses they need to carry out and this could make it easier for them to decide whether it is worth taking an entrepreneurial opportunity or not.

Impacts

In most cases the impact of the module might occur indirectly and over the long run. The positive impact on the Sustainable Development Goals could only be seen in the long term. The Module could have an indirect influence on the way students think and act. The sustainability engineers who attended the module would have worked in sustainability anyway and now they know more about business model development. But some of the industrial economics engineers were much more interested in sustainability after participating in the module. Perhaps they will pay more attention to sustainability issues in their careers and in their private lives.

3.3.6 Key insights and learnings

The following section summarizes the key insights gained from the fact sheet, the student survey and the interviews with the lecturers and students. Based on the research design, the key insights and learnings are formulated from the external perspective of the University of Oldenburg. The learnings are primarily seen as possible recommendations. The feasibility of the key insights and learnings must be verified by the lecturers at Linköping University.

3.3.6.1 Motivation and interests of participants

The evaluation of the student interviews and survey indicates that the combination of sustainability challenges and topics of business model development has been a major motivation for the engagement in the module. Students are particularly interested in the question of how a successful sustainability-oriented business model development process can succeed. This combination is not yet covered by other modules. Accordingly, the unique selling proposition of the module should be maintained and expanded, for example by intensifying the integration of business partners.

The practical relevance of the module in the area of sustainability and entrepreneurship is also an important objective of the module and motivation for the lecturers. It should be examined to what extend the module can be integrated into the regional innovation- and start-up-ecosystem in such a way that a pool of business partners and business ideas can be systematically integrated in order to reduce the regularly preparatory effort. In addition, the interests and motivations of students could be better taken into account through a systematic involvement of business partners, because this might increase the commitment of the students.

The course design and the results of the evaluation show that both students and lecturers are highly motivated.

3.3.6.2 Key persons and promoters

The lecturers take on different roles in the module. On the one hand, the interdisciplinary team has an

expert role when it comes to scientific backgrounds and the introduction of tools and methods in the areas of sustainability and entrepreneurship. On the other hand, the lecturers also act as coaches who support the student-teams with their different experiences and competences in the development of their business ideas. Especially in the field of sustainable entrepreneurship, a transdisciplinary approach with different competencies is often crucial.

It can be worthwhile to consider whether the lecturers can offer a certain contingent of support to the individual teams. For example, lecturers could offer students their individual competence profile to the students as part of a fictitious advisory service. The individual student teams could make use of a certain contingent of counselling. This would increase the practical relevance, since external support would have to be "bought in" with the limited resources of a "start-up".

The teamwork of the students is essential for the success of the module. They are also an essential promotor within the university to attract future participants.

By involving business partners more closely, they can also become key persons and promotors. Good project results and a successful cooperation between university, business partners and students can also increase the attractiveness of the module for other business partners and thus facilitate the acquisition process in the future.

3.3.6.3 Drivers, barriers and success factors

Students and lecturers are key persons for the success of the module. This applies in particular to the positive learning atmosphere of the module.

The focus of the module is on the learning process. So far, the developed business ideas are not usually pursued after the end of the module. This open setting is definitely a driver to try out different methods with a relative low risk of failure and also to reflect learning experiences. But it could also be a motivation barrier for some students. If students already assume that their business idea will most likely not be pursued further, then the seriousness of the processing may also decline. Therefore, the following variants could be considered to reduce this barrier: Integration of business partners who provide challenges from the respective company to the student teams. Further support services could be awarded for the best idea from the respective module in cooperation with private or public start-up supporters.

3.3.6.4 Unique elements

The transdisciplinary approach with scientific expertise in environmental science and entrepreneurship education in combination with a focus in business practice is quite unique compared to other modules.

3.3.6.5 Strengths and weaknesses and need for improvement

The independent working style and the clear structure of the module in combination with the transdisciplinary approach are distinct strengths of the module.

Students are sometimes a bit challenged by the variety of available tools and methods. This is also reflected in the survey, as not all participants can remember the methods and tools used in the module. Choosing appropriate approaches is an essential part of the learning process. However, it may be necessary to consider whether the number could be reduced or whether a selection guide could be developed. From the lecturers' point of view, it should be examined to what extent sustainability-oriented tools and methods can be used in the module in the future.

It is also noteworthy that the connection between module content and the written examination cannot be classified by most of the participants of the survey. The written exam is also criticized in the interviews with the students. Therefore, the necessity of the written exam should be reviewed. Perhaps the written exam could also be structured in such a way that knowledge is tested which is necessary for the concrete development of the business idea in the module.

From the students' point of view, the involvement of more business partners could contribute to the improvement of the module.

The matching process for the student teams could be extended. For example, more attention could be paid to the representation of different competences and experiences in the student-teams.

3.3.6.6   Transferability and scalability

Students and lecturers agree: the module is scalable and can also be integrated at other universities. The basic requirement is the willingness of lecturers with different scientific backgrounds to cooperate. Furthermore, there should be contacts to the regional innovation- and start-up-support system in order to identify sustainability-related challenges and to work together on business solutions and business models.

3.3.6.7   Outcomes and impacts

There is no clear picture when evaluating the outcomes of the module with regard to the participant's progress in their studies and to their later career. One half of the survey participants tend to give a positive assessment and the other half rate the outcome lower or are not able to classify it. This may be due to the fact that participants who have recently participated in the module may not really be able to consider the long-term impact of the module on their career.

The same applies to the social, environmental and economic impacts of the student projects. Basically, students believe that there is a positive impact on the three dimensions of sustainability dimensions. The lecturers share this view as well. In the long run, the Sustainable Development Goals may be positively affected if, for example, former participants start working on sustainability issues during their careers. The verifiability of this statement would require a long-term survey. However, it will become more and more difficult to acquire survey participants for a longer period of time.

3.3.7   Conclusion

Overall, students and lecturers are quite satisfied with the module. The module focuses on the learning process and on the development of entrepreneurial competences. The identified key insights and learnings show that especially a better integration of business partners and sustainability-oriented tools and methods could further increase the attractiveness of the module. The balance of interests between business partners on the one hand and the interests of students and lecturers on the other hand should be reflected. Otherwise, there is a risk that the learning focus will become less important and that the focus will shift to consulting business partners.

3.4   CASE STUDY EVALUATION REPORT 3: FUJIFILM FUTURE CHALLENGE (THE NETHERLANDS)

3.4.1   Fact sheet

Factsheet Student/Business cooperation in green venturing S4S

Status: 18 March 2019

Module **in general**

Title of module	**Fujifilm Future Challenge**
Initiating university:	Avans University of Applied Sciences

Start year	2016
End year / ongoing	ongoing
No. of modules held	3 programs
Duration (weeks)	10
ECTS:	2
Module objective(s)	Generate new sustainable businesses for Fujifilm
Phases & activities (in key-words only)	1. Ideation 2. Validation of business models
No. of business projects so far	29 new business models
No. of business partners so far:	1
No. of students so far:	150

Balance involvement between Business / Student:

Student involvement per module

(Characteristics of students typically included in the module)

No. of students	142
Level of students	Bachelor level 116;　　Master level 26;　　PhD level; 　　 [X]　　　　　　　　　 [X]　　　　　　　　 [ ]
Background students	Technical 12;　Managerial 118;　Environmental 4;　Other 8 　　 [X]　　　　 [X]　　　　　　 [X]　　　　　 [X]
No. of universities/ professor-ships involved	4
Number of Faculties involved	6

Business involvement per module

(Characteristics of business partners typically included in the module)

No. of companies/ venture teams/ start-up teams	One company	
Age of business partners	Pre-seed (1-3 months):	☐
	Seed (4-12 months):	☐
	Start-up (1 year):	☐
	1st Stage (1-3 years):	☐
	2nd Stage (4-6 years):	☐
	3rd Stage or later (>6 years):	☒
Size of companies FTE (no. of companies)	Single entrepreneur:	☐
	Venture team (<5 employees):	☐
	Micro enterprise (5-10 employees):	☐
	Small (10-25 employees):	☐
	Medium (25-250 employees):	☐
	Large (>250 employees):	☒
Size of companies sales (no. of companies)	None:	☐
	Small (<1 mln €):	☐
	Medium (1-10€):	☐
	Large (>10€):	☒
Typical Branches (no. of companies)	Industry 1; Services; Government; Not for profit;	
	☒ ☐ ☐ ☐	

Sustainability items covered

People issues (social)	Yes
Planet issues (sustainable)	Yes
Profit issues (business)	Yes
keywords of sustainable subjects covered (max 10)	Waste reduction, reduced raw materials, climate change, health, biodiversity,

Personal assessment (qualitative)

Which activities & methods have been effective:	Which improvements could be made:
1. Design thinking exercise 2. Creativity in practice: out-of the box solutions for sustainable challenges 3. Student/business Collaboration	1. Reducing drop-out ratio of student teams 2. Improving innovativeness of ideas 3. Adding more quantitative aspects
Main outcomes of the module	1. New 'fresh' business ideas for Fujifilm 2. Improved corporate image of Fujifilm 3. Exercise in developing and validating new business models

3.4.2 Explorative interviews with students

Characterisation of the interview partners

One respondent works as a "Knowledge valorization officer" at a university and two interviewees are still studying. The interviewees are e.g. Bachelor students at Avans University in the field of innovation and international business. Two interviewees attended the module in 2018/2019 and one interviewee in 2016. Sustainability is of general importance for the interviewees during their university studies. For one interviewee it is also relevant in personal life. Entrepreneurship has some relevance for the interviewees and there are links to entrepreneurship in the context of family background.

Motivation and interest

The respondents attended the module voluntarily and were particularly interested in cooperating with Fujifilm. The interviewees were very interested in a practically oriented module. The form of cooperation was new for the interview partners. Before the start of the module, there were no specific expectations regarding the concrete design of the module.

All interview partners were already interested in innovation topics before the module started. This is partly due to the focus of the whole curriculum. Sustainability was the focus of one respondent's academic studies and another respondent considered to write his master's thesis in this area. One interviewee pointed out that there are strong links between innovation, entrepreneurship and intrapreneurship. All interview partners also have a basic interest in entrepreneurship. In the module, one respondent was able to benefit from previous experiences from other modules in marketing and strategy. He also gained first experience of starting a business during high school. Further experiences of the interviewees in the areas of entrepreneurship, innovation and sustainability also originate from other modules.

The Activities

The project teams (2-4 people) worked for example on the following project ideas: a dog leash that kept track of the health of the dog as well as a business model in the context of sustainable tattoo colour.

The visit of the FujiFilm Innovation Hub as well as the collaboration with FujiFilm employees were positively evaluated by the respondents. The introductory event was also rated positively by one of the interviewees. The use of methods was also positively evaluated. For example, the following methods were used: brainstrom techniques (mind maps), prototyping (Lego Serious Play), value chain analysis, cost-benefit analysis. In addition, customer surveys were developed and discussions with potential business partners were conducted.

Support of lecturers

The extent of support provided by the lecturers could be increased from the students' point of view. However, some interviewees did not actively ask for support. The concrete support from Fujifilm was very helpful. The project ideas were developed with the FujiFilm staff.

Biggest challenge

The group work, the project planning (including time management) and partly the lack of identification with the project idea were regarded as challenges by the interview partners. An interview partner did not spend enough time to the module, because it was an extra-curricular module for him because of exam obligations in the timeframe of the Fujifilm program. In addition, it was a challenge to familiarise oneself with technical details without a technical background.

Assessing the module

The cooperation with a large company was evaluated positively by the respondents. The kick-off event was also a strength of the module. The time planning of the module could be optimized from the students' point of view. The business partners would primarily see the final result. In some cases, they could be more closely involved in the work process. The module was mandatory for some participants and not for others. As a result, in some cases the intensity of engagement varied.

From the point of view of the interview partners, the module could be made accessible to more students and could also be used at other universities.

Outputs and outcomes

One interviewee continued to deal with the topic after completing the module. The interviewees also became more aware of the challenges associated with activities in the context of innovation, sustainability and entrepreneurship.

Impacts

If the product ideas were implemented, they would have a positive impact to the SDGs from the point of view of the interview partners. However, the impact of the project itself is limited. The project promotes interest in venturing, which could lead to a positive impact in the long run.

3.4.3   Student survey: Motivation, experiences and observed impacts

Characterization of the responding students

Twelve out of 132 students responded to the survey (corresponding to a response rate of 9%), most of them participated in the module in 2018 (9 students), and the rest in 2017 (3). The participating students came from a range of programs. Four studied the ASIS Challenge program, one International business, one International management and another at Avans Innovative Studio. Five of the students did not list a program.

Motivation and interest

When the students ranked the motivation to participate in the module (Figure 16) reasons that for the majority were considered extremely important or very important were to develop new competences, the possibility to collaborate with companies, the combination of sustainability and entrepreneurship and to experience a different teaching set-up. One student further highlighted the possibility to build practical experience with companies (communications; pitches; etc.). For very few the module being compulsory was addressed to be very or somewhat important. Additional motivation highlighted as other reasons

were the fact that the challenge seemed interesting and fun.
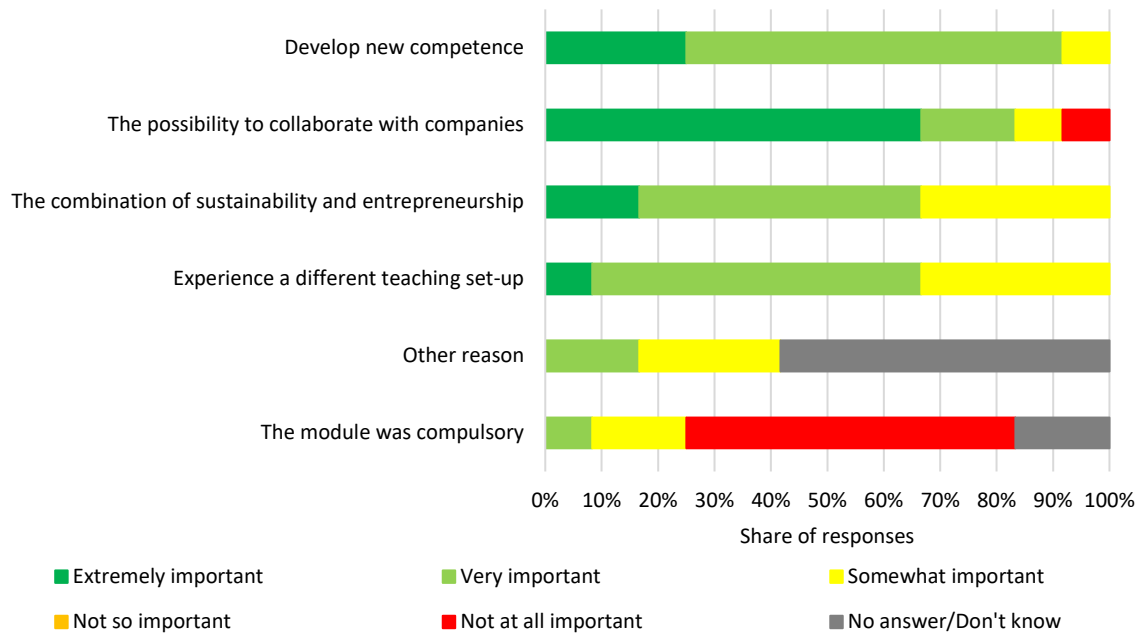
Figure 16: Compilation of the results from Q3 Why did you participate in the module?

In the survey we asked the students to assess their interest before and after the module for the following topics; Sustainability, Entrepreneurship, Innovation and Sustainable Entrepreneurship (Figure 17). All students considered themselves to be interested in sustainability from the beginning of which 50% were extremely or very interested. Four students changed their interest during the module, two of them increased their interest and two decreased theirs. All students except one had some kind of interest in entrepreneurship before the module. The interest in entrepreneurship grew for five students while it decreased for one. The interest in innovation before the module was like that for entrepreneurship, five of the students had increased their interest in innovation after the module, the rest stayed unchanged. The combination sustainable entrepreneurship had a slightly lower interest than sustainability and entrepreneurship separately. The interest did though increase for six of the students whereas it decreased for one.
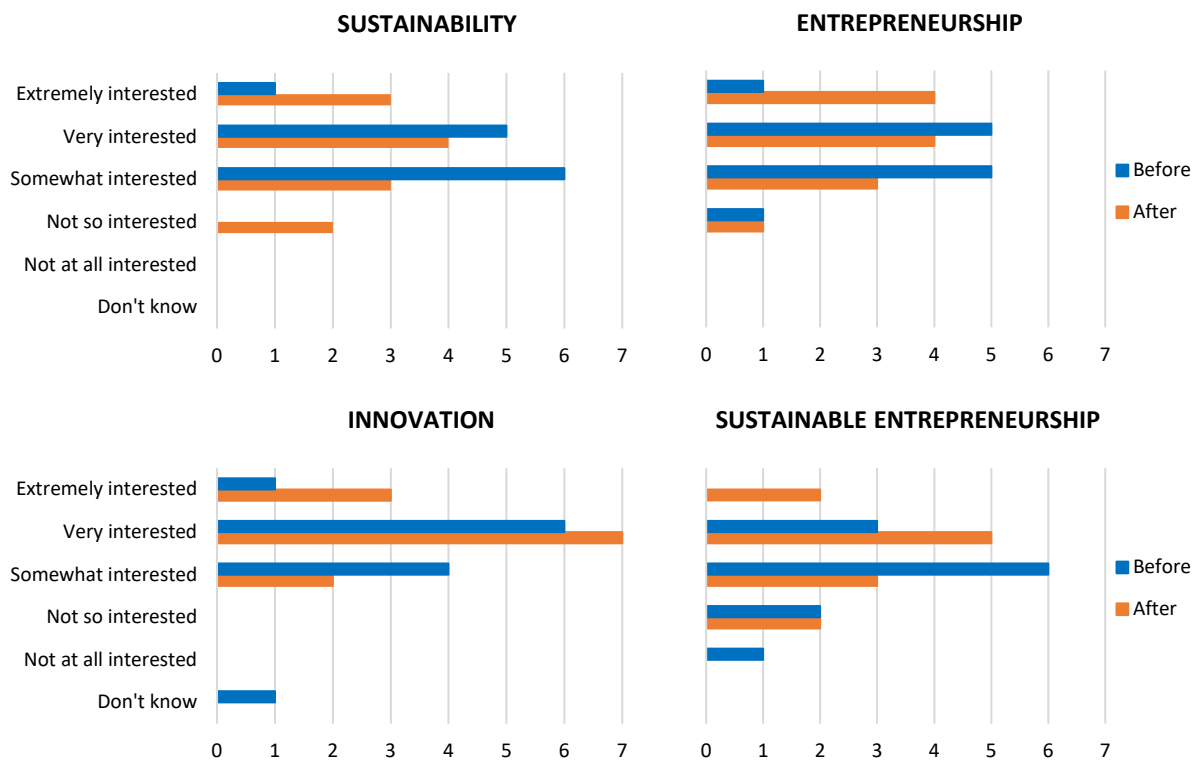
Figure 17: Compilation of the results from Q4-11 about interest in Sustainability, Entrepreneurship, Innovation and Sustainable Entrepreneurship before and after the module (x-axis show number of responses).

Background to project work on developing business ideas

During the module the students performed project work in groups of 3-5 students (Figure Annex I**Fehler! Verweisquelle konnte nicht gefunden werden.** in Annex 12). Regarding the diversity within the project groups (Figure Annex H**Fehler! Verweisquelle konnte nicht gefunden werden.** in Annex 12) half of the students responded that their group had no diversity as all students where from the same program. Two students considered the group to have a great deal or a lot of diversity and the rest moderate or little.

Assessing the module

To highlight the strengths and weaknesses of the module a list of statements was presented for the students to assess (Figure 18). A statement is considered a strength if >50% of the students have responded extremely/very/somewhat high. Whereas if <50% it is considered a weakness and that there is room for improvement.

All the students considered the possibility to think freely and differently to be extremely, very or somewhat high and a similar result was observed regarding synergies from teamwork. More than 70% of the students considered the module to have extremely, very or somewhat high practical relevance and almost 60% of the students considered the connection between tools/methods and the project task to be extremely/very/somewhat high. The commitment of the teachers was considered to be extremely/very/somewhat high by 2/3 of the students.

Room for improvements (weaknesses) were identified related to the invited guest lectures, the connection between lectures and the project work as well as the connection between module credits and workload.
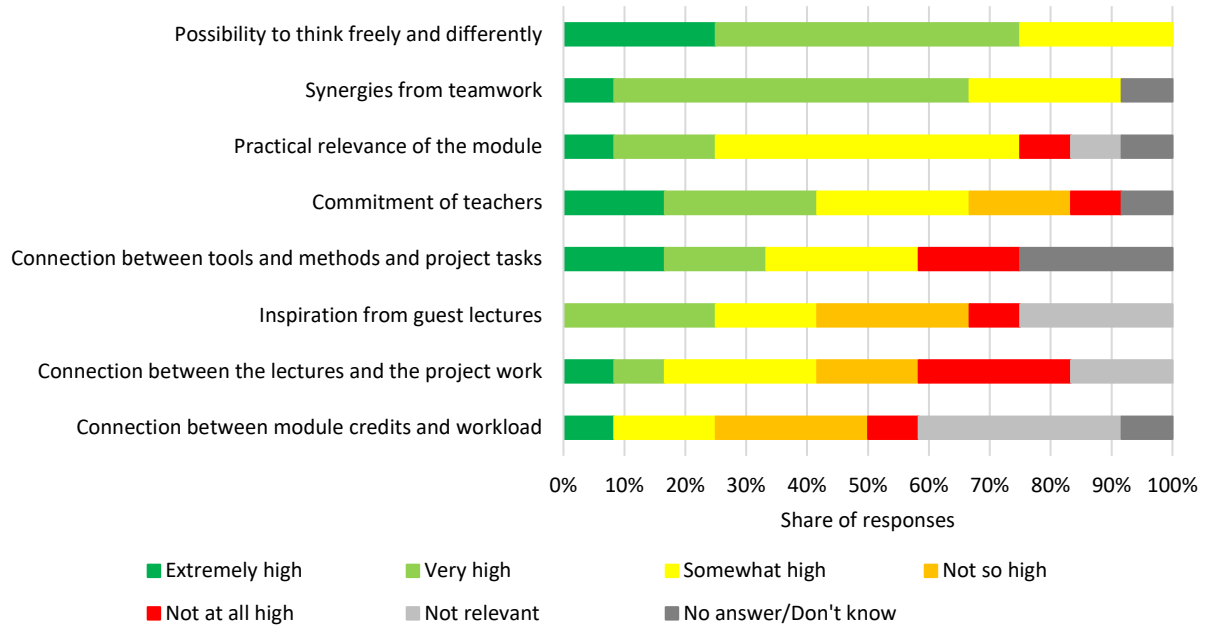
Figure 18: Compilation of the results from Q14 Respond to the following statements in connection to the module (strengths and weaknesses)

As addressed above, most of the students considered the connection between tools/methods and the project task to be extremely high, very high or somewhat high. When asked to remember and list the most helpful methods and tools a total of 17 were listed (Figure 19), 3 of the 12 students commented that it was difficult to remember and didn't list any method/tool. Seven different methods/tools were ranked as the most useful and most frequent are *Brainstorming* which compiling all the ranking levels also was listed the highest number of times, this together with *Support from teachers/supervisors*.
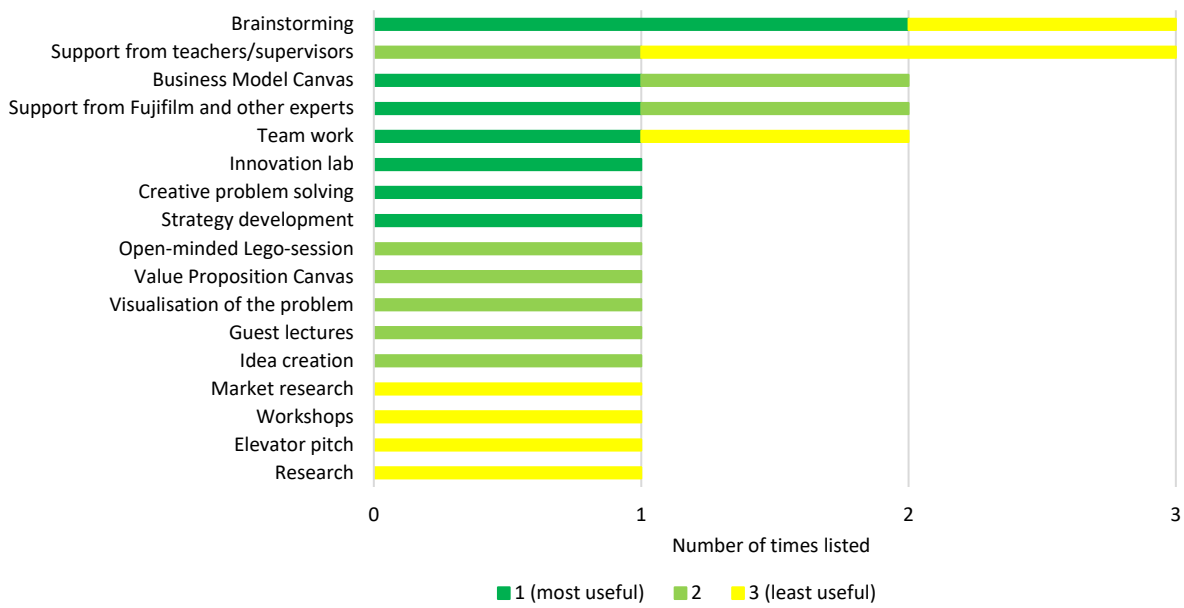
Figure 19: Compilation of the results from Q15 Which were the most helpful methods and tools that you used in the module? Rank up to five methods from 1 (most useful) to 3 (least useful).

Outcomes

When addressing the outcomes of the module a majority of the students listed increased personal competence and a new business idea (Figure Annex K in Annex 12). One student answered a new business model and another student an improved business model. Two students listed other outcomes and specified them as "increased knowledge of Fujifilm's portfolio" and "nothing at all".

The students were further asked about the importance of the module for the progress of their study as well as their job choice and career (Figure 20). 5 out of 12 students considered the module to be important for the progress of their study and 4 out of 12 for their job choice and career.

When instead considering the outcomes in relation to the business partner (Figure Annex J in Annex 12) 4 out of 12 considered the outcome to be extremely/very or somewhat important for the business partner.
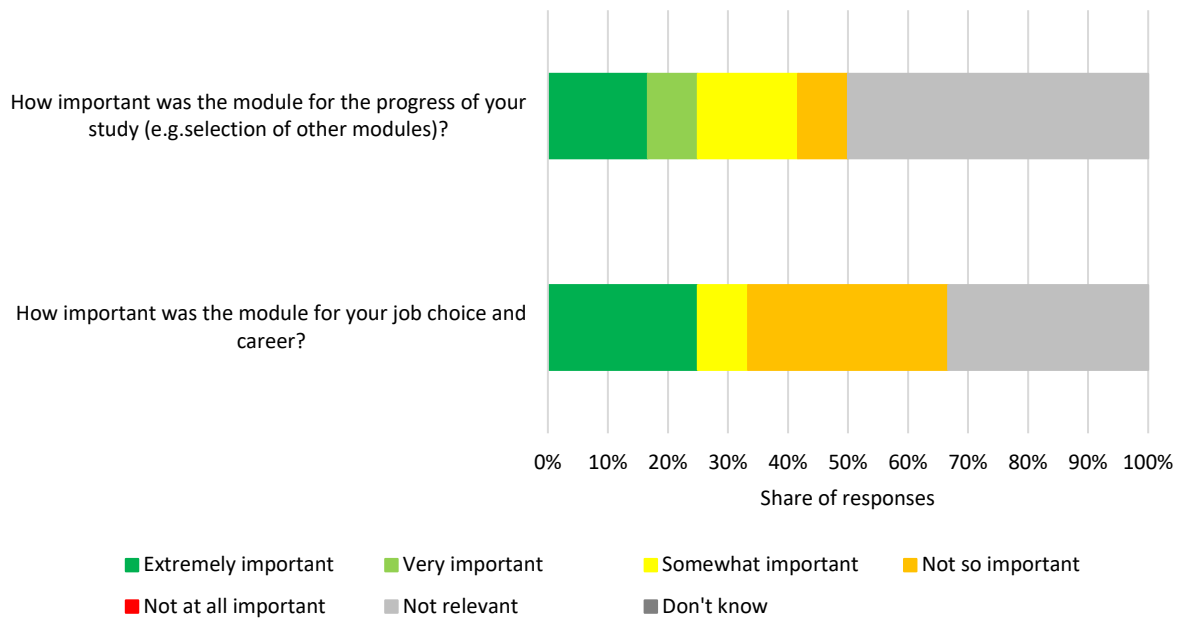
Figure 20: Compilation of the results from Q17 How important was the module for the progress of your study (e.g. selection of other modules)? and Q18 How important was the module for your job choice and career?

Impacts

The (potential) impact of the projects were valued a bit different depending on if social, environmental or economic benefits were considered (Figure 21). The ratio of significant and major impacts was higher for
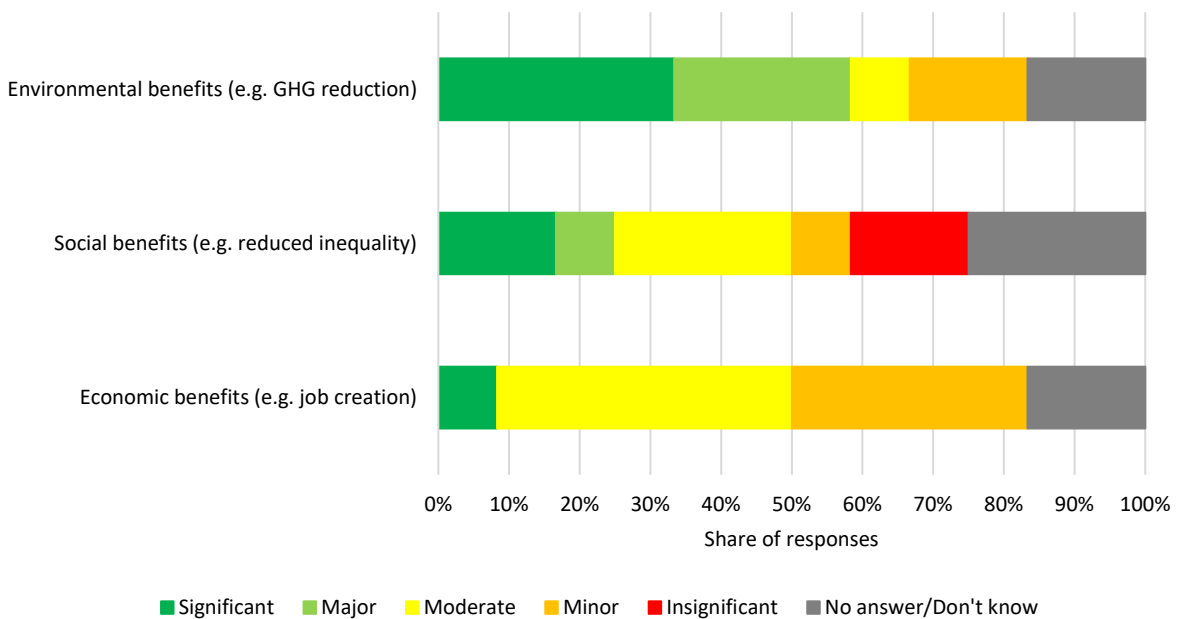
Figure 21: Compilation of the results from Q20 What was the (potential) impact of your project on society or the natural environment?

environmental benefits compared to social and economic benefits. Less than 10% of the responses considered the impacts as insignificant.

Suggested improvements

Finally, the students were given the opportunity to give suggestions on how to improve the module, an opportunity that was taken by 7 of the 12 students.

Regarding the involvement of business partners, a suggestion was to increase the collaboration throughout the study program. Several suggestions were given regarding the content of the module:

- Include training in giving elevator pitch on business cases.
- All ideas should be developed if competent.
- Making it clearer what the company would like to see as a result of the project.

Improvements regarding the format and the setting was also given with the suggestions to increase the support from lecturers, to incorporate the module into the regular curriculum and to make sure that there is an equal workload when comparing the different schools involved.

See Annex 12, Table Annex C**Fehler! Verweisquelle konnte nicht gefunden werden.** for the full list of suggestions.

3.4.4 Business partners: Experiences and observed impacts

Characterization of the interview partners

The interview partner is Manager of an Open Innovation Hub. His role is supporting new business development through (1) making new connections between outside and inside for the business partner (2) finding market needs for applications areas for the business partner technology. Entrepreneurship is currently a main part of his professional life, although the respondent is a technical professional without entrepreneurial experience. Sustainability is important for the business partner company as well as for the respondent.

Motivation and interest

The business partner wants to learn new competences, new markets and new ideas. The Future Challenge is one of the tools to become more open and to become inspired by new ideas from a new generation. For the Open Innovation Hub and the Future Challenge, it is very difficult to define very concrete output targets because both focus on the front end of innovation; here, new ideas and new visions are most important.

The Activities

In the last three editions of the Future Challenge, the business partner kept the room for venture ideas quite open without focus of the ideas. This year the area for innovative ideas is more specified in order to match with the current scope of activities. The Business Model Canvas, creativity tools, and Lean Customer Development are the main methods and tools.

Support of lecturers

The lecturers supply the educational content (ideation and customer validation), organize the Future Challenge, and coach the students. The business partner gives answers to all technological questions.

Biggest challenge

The biggest challenge for the respondent is to stay open for the questions of the students, not jumping too quickly to solutions and provide them only with a limited number of options rather than just answering the questions. Sometimes lecturers are not sufficiently enough helping the students. They could stimulate the student teams more actively in their struggle of the ideation or making a choice out of all ideas.

They should be a bit stricter and less laisser-faire.

Assessing the module

Two types of students are participating in the Future Challenge: practical students, who are presenting well, using infographics and prototypes, and analytical students. Both groups are lacking each-other skills: the practical students should become more analytical and the analytical students more practical. A mix of both types within a team would be an ideal situation; students are sometimes too unilaterally educated. The Future Challenge is unique because (1) it has a very close relationship with one company with access to in-depth technological knowledge; (2) puts much attention towards ideation next to implementation; (3) it is organized in an open and relaxed formula, and (4) universities with different background participate; technological and non-technological, practical and academic, Dutch and Belgian students. Other challenges have much more an element of competition between the teams. Competition and pressure will not always lead to the best ideas. The strengths of the Future Challenge are the focus on ideation, a more collective and not competitive approach. Teams can learn from each other. They get feedback about their ideas from the company, and from each other. Other challenges are more competitive and therefore secretive. As a result, learning is less collective and more individual. Although a downside of lack of competition is that student team face the risk of being too relaxed, they might not push very hard to achieve the very best results. The formula of the Future Challenge is improved by (1) making it more specific and tailored towards the strategic interests and technology platforms of the business partner; (2) formalizing the organization of the Future Challenge with a playbook, assessment criteria, and deliverables. A next improvement might be working with 'mixed' teams in which students from diverse background collaborate, e.g. a combination of business, technological, and creative students. Technology students usually stick to technological solutions while business students go beyond technology. Technology students sometimes forget the business aspects ("who is willing to pay for the solution"), while business students have sometimes difficulty to work with technologies. Therefore, a mix of both is ideal. The respondent prefers to have teams with a mix of analytical and practical students, or even a mix of students from various countries and cultures. Depending upon organization the Future challenge can be upscaled.

Outputs and outcomes

The business partner is still working on one of the business ideas of the Future Challenge. One of the business ideas of the Future Challenge is proposed to the corporate headquarters abroad. The business partner uses the Future Challenge for branding, both internally and externally. It is very important for the business partner to get new ideas from outside because they are looking for new markets. The Future Challenge is used to show to colleagues in other countries how and what the European branch is doing. The company image of the business partner in the region has improved. The 'front end of innovation' research group of the business partners is now operating in a different way and is using one of the business ideas derived by the students. This student project gave the business partner some new insights on the business models in that specific industry. So far, the business partner has not brought any ideas to business yet or have started R&D projects initiated by the business ideas.

Impacts

The challenge has an effect on the longer term. For students, it is inspirational to see what you can do with technology, it is making students more aware of sustainable technology.

3.4.5 Teaching team: Experiences and observed impacts

Characterization of the interview partners

Three people engaged in the teaching team of Fujifilm Future Challenge were interviewed for this evaluation; one being a Professor in International Business, one being a coach within an innovation studio at a Dutch university of applied sciences and the third being a lecturer and coach at a Flemmish university of applied sciences. All three are working with sustainability and entrepreneurship within their professional

roles however to a varying degree. One is both teaching and doing research on innovation, entrepreneurship and sustainable business as well as acting as an incubation expert. For the other two the focus is mainly on coaching of students in projects where sustainability, innovation and entrepreneurship are integrated.

Motivation and interest

One of the interviewees is the initiator of the challenge and now acts as a project leader arranging and developing the challenge as well as teaching the coaches supporting the student groups. The other two are coaching student groups at their respective university who are involved in the challenge. One of the coaches got the proposition to be involved from the initiator whereas the other one got to know about the challenge and found it very appealing for their students.

The reasons expressed as for why they personally are participating in the challenge are: the strong belief in collaboration between students and companies; a very interesting topic as it includes ideation as well as elements of entrepreneurship and validation; very interesting to work with a multinational, technology driven and innovative company who wants to change; to get the possibility to again bring together multidisciplinary teams together to solve a problem from an external partner in an innovative way.

All three had an interest in both sustainability and entrepreneurship before being engaged in this challenge. One of them had yet no practical experience of working with sustainability before. Regarding entrepreneurship all three express a big interest in entrepreneurial creativity.

Experiences and competencies before

All three have experiences of entrepreneurship in terms of teaching and coaching students but they have also all experiences in starting up and running their own company. The initiator/project leader also has research experience as acting as an incubation trainer/coach and facilitator in developing countries. One of the coaches earlier worked as a project manager at Flanders District of Creativity stimulating entrepreneurial creativity amongst businesspeople and education.

The expressed experiences on sustainability is mainly related to coaching students in projects where sustainability is an important element. But as earlier stated one of the interviewees are doing research on sustainable business.

Content and knowledge highlighted as helpful for the projects within the challenge were:

- Entrepreneurship and innovation are very closely linked so all innovation knowledge as well as knowledge about starting up a business.

- Knowledge about personality. What kind of personal competence that you need in a start-up such as perseverance, initiative, thinking out of the box etc.

- Knowledge about sustainability and that it is very broad and for example not only about a material and if it is 100% circular or not.

- Earlier experience on arranging workshops about entrepreneurial thinking and how to stimulate the entrepreneurial attitudes and to use creativity.

- Knowledge about the methodology of Design Thinking and Business Model Canvas.

The Activities

The project has two phases, the ideation phase and the exploration phase - developing the business model and testing the business model.

In the first phase creativity tools like Lego serious play, brainstorming, ideation, prototyping, business model canvas etc are used. Tools/methods triggering imagination are important. In the second phase Design thinking methods are applied to get contact with the market. The students are learned how to use creative thinking questions connected to a company and that you can come up with sustainable solutions

if you focus on doing that. One of the interviewees also emphasizes the use of scrum technology to learn time management.

Role of lecturers

The role of the lecturers involved in the challenge (the case for two of the interviewees) are to be coaches mentoring the team processes and encourage the students to think out of the box.

Biggest challenge

The following challenges were addressed during the interviews:

- Time management – both for students doing the challenge over a full period (often as extracurricular) and for those students who work with the challenge focused for two weeks.

- The broad scope and the (deliberate) lack of focus themes of the challenge. Giving them borders would make it difficult to think out of the box, but it would be easier for the students.

- The challenge is technology-driven: understanding technology is an issue, because most of the students are not studying courses related to technology. To learn the students that innovation is not only for technological people, they can independent of background learn how to be creative and come up with technical solutions.

When assessing the knowledge of the students entering the challenge, their very different backgrounds are addressed. Their overall knowledge is, however, considered as sufficient by all of the interviewed. What is also addressed is personal skills, such as having the ability to take initiative, be perseverant, to think out of the box and to dare to take contact with Fujifilm, other students, the market etc. It is also highlighted by one of the interviewed that the challenge involves both bachelor and master students as well as university students and applied university students, leading to a diversity of knowledge and skills. The University students should be more practical, for instance in prototyping and the students from the University of Applied Sciences must be more precise in their calculations, projections and analysis.

When it comes to the business partner, they all agree on that they have sufficient knowledge when it comes to technology and to evaluate the feasibility of the business ideas. One of the respondents however highlights that sometimes it is difficult to translate the Fujifilm technological know-how into more simple terms to facilitate understanding for all students.

Assessing the module

The uniqueness of the module is viewed on differently by the interviewees. The project leader of the challenge highlighted the following:

- A consultancy project leading to a winner, providing a great incentive (a trip to Barcelona for the best idea)

- It is open to several universities, and to several tracks within a university

- Research-based learning, we have an ex-ante and an ex-poste measurement of several aspects.

The two coaches focus on the company and mention the close connections between the students and Fujifilm. The students get to meet a jury and present their ideas. They are much more connected to the company than in other projects. Fujifilm shows a lot of interest and engagement in the students and clearly is highly motivated being involved in this project.

The motivation and engagement of Fujifilm is again addressed when it comes to the strengths of the program: it is a real case with a real company really in need of new ideas. Other strengths addressed are: the students become aware that there is more than one solution to a problem as all the groups come up with ideas; the competition as driver for development; the module being international and the language English; the module runs over a whole semester forcing the need of time management.

The collaboration with Fujifilm is also addressed as a weakness as there is a risk of being too dependent

on only one company which can give the students less freedom. Another issue addressed is time: time management is tough because the module is very time consuming and extracurricular at the same time.

Several improvements have been done recently (not applied before this evaluation): developing explicit assessment criteria, manual, a play book, study guide, online tools etc. Also, the focus of the project is made narrower. One of the coaches addressed the need of broadening the knowledge within the student groups. Regarding the university support system, there is also one improvement to be done as it was not possible to invite all involved universities to use the host platform, instead Google Drive, Dropbox etc. is now used.

They all see a possibility of up scaling the module but in slightly different ways. The challenge could be slightly enlarged and include some more groups. It could be copied in another country or with another business partner and the two could be compared. The ambition to internationalize the module involving more universities and several companies is presented; this is, however, complex due to logistical reasons.

Outputs and outcomes

Except for the business ideas, the main result addressed by all three respondents is the students learning. The challenge gives the opportunity to obtain business experience such as experience of innovation, entrepreneurship, pitching and developing new ideas. The cooperation and connection as such between the students and the company is also addressed as one result. Furthermore, another result of the challenge is the learning that takes place between the different universities involved.

It is difficult to assess the importance of the learning that takes place; however, all address the student's entrepreneurial development throughout the module. They develop an awareness of that having a very nice idea, does not cover the entire innovation journey, additionally, you need entrepreneurship and persistence in order to fulfil the process of developing and validating a business idea. The project leader notices that the module stimulates entrepreneurial behaviour more than it stimulates purely sustainability. The coaches addressed the fact that sustainability is included in many other modules as well, however, the challenge combines sustainability with developing new business ideas.

There are also learning outcomes for Fujifilm. Although, the impact of specific ideas is limited, the new ideas inspire new developments and perspectives. For Fujifilm, another result is also the corporate image among future potential employees, students and the student community at large.

The two coaches identify their personal learning in developing their skills as coaches in supporting development of new ideas and to be creative. One of them also highlighted the learning about the development of group dynamics for each group involved. The project leader stressed the importance of coaching the team processes in order to avoid teams from quitting the program. Finally, every year, the program is further developed and professionalized as a result of the learnings.

Impacts

None of the interviewed measure the long-term impacts of the module. However, short term module evaluation is performed locally at the universities. The project leader of the challenge is doing research about the students' development during the challenge by an ex-ante measurement of competences and an ex-post measurement of team performance.

When it comes to important impacts of the module and any possible contribution to the sustainable development goals (SDGs), none of them notice that specific business ideas have had impact. What is addressed is the knowledge and skills of the students which can be used to create impact in the future. Increased employability is also raised as another impact.

The two coaches expressed that the students work with the SDGs during the challenge. Both, the students and the company gained knowledge and new skills based on their experiences implementing the SDGs. The project leader stressed that the module is too limited to have a large impact. Improving sustainable business skills needs a longer timeframe.

3.4.6   Key insights and learnings

3.4.6.1   Motivation and interests of participants

Students, teachers and the business partner all have an interest in sustainability and entrepreneurship, however, for the students the interest is somewhat lower for entrepreneurship than sustainability.

The cooperation with Fujifilm, being a multinational, technology driven and innovative company who wants to change, is addressed as a motivation for both students and teachers. In turn, the business partner wants to learn new competences, new markets and new ideas and the Fujifilm Future Challenge is one of the tools to become more open and to become inspired by new ideas from a new generation.

In addition to the above, the students have an interest in innovation and entrepreneurship. The interest in sustainable entrepreneurship is slightly lower, still it is considered an extremely/very important motivation for participating in the module. More motivational factors of high importance are to develop new competence and to experience a different teaching set-up (e.g. a practically oriented module).

For the teachers, additional motivation and interests for participating in this module are the topic including ideation as well as entrepreneurship and validation, and entrepreneurial creativity. The teachers have a strong belief in collaboration between students and companies and the possibility to bring multidisciplinary teams together to solve a problem with an external partner in an innovative way.

3.4.6.2   Key persons and promoters

One key person is, of course, the initiator of the challenge and that person still belongs to the teaching team as project leader as well as teaching the coaches supporting the student groups. Furthermore, this module would not have existed without a business partner, in this case Fujifilm. Fujifilm provides a portfolio of technologies and support the students mainly with technological questions. The engagement shown by the business partner is key for the module, which is addressed both by the teaching team and the students.

Central for succeeding with the module is also the teaching team. They supply the educational content, organizing the challenge and coaching the project groups through the process and triggering the students to think outside the box. From the student's perspective, the coaches' roles could be even further strengthened to more intensively support their teams' processes.

3.4.6.3   Drivers, barriers and success factors

One important observation of this module is that entrepreneurship and innovation are closely linked. It is beneficial to combine both topics in the same module. The organizing team had earlier experience in arranging workshops about entrepreneurial thinking and stimulating entrepreneurial and innovative attitudes and creativity.

The barriers identified are related to university administration, the character of the module and the actors involved. The university administrative systems should become more flexible in order to enable programs with external partners, either from the academic or the business world. Currently, the universities' support systems are a barrier: it is hardly possible to invite other universities to use the host's e-learning platform. Therefore, external platforms (e.g. Google Drive) had to be used.

The challenge being very technology driven can be overwhelming to some students who are not studying technology related modules. One important barrier to overcome is therefore to learn the students that innovation is not only for technological people and to learn the students that the necessary technological knowledge can be obtained by non-technological people. Independent of educational background they can learn how to become more creative and develop technical and business solutions.

A module like the Fujifilm Future Challenge is dependent on the actors involved (students, teachers and

business partners) and how they collaborate. A major barrier is to find the appropriate teachers and business partners and to understand which students that are in the module and what knowledge they have. In addition, identifying and selecting students, who are motivated to participate in an intense extra-curricular activity, is sometimes difficult. Teachers must cover a broad range of disciplines. Business partners must have sufficient technological knowledge and have the capacity to evaluate the feasibility of the new business ideas. They should also be able to translate their technological know-how into more simple "non-expert" terms.

Since this module combines students with different backgrounds it becomes important to understand what their previous knowledge are and that individual students can and must complement each-other skills. The practical students can learn to become more analytical, more precise in their calculations, projections and analysis, and the analytical students can learn to become more practical, for instance in building basic prototypes. A mix of both types within a team would be an ideal situation.

Success factors mentioned are knowing about and using the different personalities of students. In a start-up, using these differences is indispensable. What is also addressed is personal competences such as the ability to take initiative, be perseverant, to think out of the box, and to dare to take contact with others (Fujifilm, other students, potential customers etc.).

For teachers it becomes important to have an open mind for the learning journey of the students and not jumping too quickly to solutions and to provide them only with a limited number of options rather than coaching and empowering the students to develop their own solutions. Also using methodology of Design Thinking and Business Model Canvas in teaching be success factors. Finally, students must learn that sustainability is very broad and for example not only about a material and if it is 100% circular or not.

3.4.6.4   Unique elements

Both the business partner and the teaching team have been asked about what is unique about the Fujifilm Future Challenge. They highlight (1) the close connection between the students and the business partner with access to in-depth technological knowledge and (2) the module being open to several different universities and educational courses of universities (e.g. technological and non-technological, practical and academic, Dutch and Belgian).

Additional unique elements are according to the business partner the focus on ideation in addition to implementation and the open and relaxed (competitive) formula.

The teaching team further highlights the fact that the business partner shows a lot of interest and engagement in the students; clearly the business partner shows a high motivation for being involved in this project. Another unique element addressed is the project being a consultancy project with a great incentive as one team will be elected as winner (a trip to Barcelona for the best idea). As mentioned before, the module is also a basis for academic research.

3.4.6.5   Strengths and weaknesses and need for improvement

The strengths and weaknesses identified have been structured and are presented as related to context, stakeholders and pedagogics and technology. Context comprises of the overall setting of the module, stakeholders focuses the individuals and groups active in the module, while pedagogics and technology activities, instructions etc.

The overall setting of student/business collaboration using Fujifilm, its employees and the Fujifilm Innovation Hub, is seen as a strength by many respondents in the survey. Students are challenged to think out of the box; they experience that there is more than one solution to a problem and practice practical creativity and co-operation with a large resourceful company. The company is assisted in ideation and finding new potential business ideas. This practical relevance of the module is highly appreciated by the students.

A module like this becomes very dependent on the actors involved and adding a business partner to a module can be challenging. Therefore, it is important that participating actors are motivated and engaged.

The teaching team observes strong motivation and engagement of Fujifilm; students consider the teachers highly committed and appreciate the synergies from teamwork. The business partner recognizes the learning in and between student teams. Another strength is the involvement of multiple universities from two countries leading to increased learning activities.

One strength (or perhaps prerequisite) for the module is that it is taught in English. Furthermore, the teaching team considers this teaching method as an excellent way to stimulate creativity, problem solving, design thinking and collaboration. They also see the combination of collaboration and competitive elements of the module as drivers for development. Students specifically appreciate the introductory event and the learning of new tools and methods used in the practical project tasks.

Regarding weaknesses or challenges: the strength of having a close collaboration with only one company can also be a weakness since the module becomes very dependent on that specific company. The strength mentioned by the teachers, i.e. that competition between student teams brings motivation, is somewhat contradicted by the business partner, who noticed that sometimes a lack of competition faces the potential risk of student teams being too relaxed.

In the past years, the Fujifilm Challenge has had a rather broad scope. On the one hand, narrowing this scope could hamper the thinking out of the box, on the other hand, it makes ideation easier for the students. Another mentioned challenge is the fact that participating students follow very different curricula, even if their overall knowledge is considered as sufficient by all interviewed. Some students mention the challenge to familiarise oneself with technical details without a technical background. Other recognized challenges are the teamwork, the project planning and, in some cases, the lack of identification with the project ideas chosen in the team. Some respondents would like to see a better connection between lectures and project work and getting more inspiration from guest lecturers; some regarded the workload to be too high in relation to the credits earned. Some also mention that lecturers are not sufficiently enough assisting the students. Time management is a challenge – both for students doing the program over a 10-week period (often extra-curricular) and for the students who conduct the Fujifilm assignment in their 2-week program of the Innovation Studio.

Based on strengths, weaknesses and interview results, some improvements can be identified: The teaching teams mentioned improvements in the areas of:

- Reducing drop-out ratio of student teams
- Improving innovativeness of ideas
- Adding more quantitative aspects to the project works.

Furthermore, the teaching team mentioned the following improvements, which are already under implementation:

- Developing criteria, manuals, study guide
- Narrowing the definition of the projects
- Taking initiatives to increasing the educational background diversity and broadening the knowledge within the student groups.

Students mention the following items as opportunities for improvement:

- Support by the lecturers
- Time planning of the module
- To value time spending equally; for some students the module is mandatory, for others extra-curricular. Some suggested to incorporate the module into the regular curriculum
- Students also experienced an unequal workload between teams and between individual students
- There was a wish to involve the business partners more throughout the entire study program

- Some wanted to include elevator pitch trainings more frequently

- That all ideas should be further developed after the module if competent

- More clarification of what the company expects as results of the project.

Fujifilm identified the following potential improvements:

- To better stimulate the student teams in their struggle of the ideation and selection of ideas

- Making the program more specific and tailored towards the strategic interests and technology platforms of the business partner (implemented in the latest edition)

- Formalizing the organization of the Future Challenge with a playbook, assessment criteria, and deliverables (implemented in the latest edition); Another improvement might be working with 'mixed' teams in which students from diverse background collaborate, e.g. a combination of business, technological, and creative students from academic and polytechnic backgrounds.

3.4.6.6 Transferability and scalability

Both students and teachers addressed the transferability of the module: including more/other business partners, transferring it to other Universities and/or other countries. Students, teachers as well as the business partner consider it possible to upscale the module by including more students. Teachers also mentioned involving other student groups.

Including more universities and companies would need well developed logistics. Upscaling would increase the possibility to compare outcomes and experiences at a larger scale.

3.4.6.7 Outcomes and impacts

The two main outcomes of the module are increased knowledge/competence and a changed interest. According to the teaching team, the module stimulates entrepreneurial behaviour and development more than it stimulates pure sustainability. This is partly confirmed by the students change in interest where increased interest mainly is related to innovation, entrepreneurship and the combination of sustainability and entrepreneurship, this compared to sustainability as such. The students increase their awareness of the challenges associated with innovation, sustainability and entrepreneurship. The teaching team further pinpoints that the students get practical business experience of developing and validating new business ideas/models. The change in knowledge and interest was for some of the students important for their future development, the progress of their study, and for their job and career choice.

For the business partner, the involvement in the module has led to new insights regarding business models and new inspiration on business ideas. So far, one of the ideas is being further developed by the business partner. The specific ideas of the students may not have had a high impact on the development of the business partner so far, but they are inspired to explore new developments and new perspectives. Furthermore, they use the Fujifilm Future Challenge for corporate branding, both internally and externally to intensify their relations with the student community.

Also, the teaching team expresses valuable learnings being involved in the module related to developing and implementing the module, collaborating with several universities, as well as in their role as coaches with learnings of group dynamics and developing their skills in supporting creativity and development of new ideas.

Assessing the potential impact of the Fujifilm Future Challenge it should be highlighted that the module covers all three sustainability issues (people, planet and profit). If the business ideas are to be implemented, they can contribute to fulfilling the SDGs, especially when it comes to environmental perspectives. Furthermore, the business partner highlighted that it is inspirational for everyone included to see what could be achieved with the existing technology; the module is making students more aware of sustainable technology and its potentials. The knowledge and skills gained in the module can increase the

students' employability and lead to potential contributions to the SDGs in their future work life.

3.4.7   Conclusion

For the evaluated period a total of 142 students at Bachelor and Master level participated in the develop-ment of 29 new business models together with FujiFilm. The Fujifilm Future Challenge can be considered as successful based on the experiences of students, teachers and the business partner. The integration of innovation and entrepreneurship, the close connection between the students and the business partner with access to in-depth technological knowledge together with the diverse competences of the students (coming from different universities and from a range of educational courses the of universities) and the skilled coaches are of high importance making this module successful.

To improve the module, it is recommended to further formalize it with a well-developed study guide sup-porting both students and the business partner and to put more emphasis on discussing the expectations of the involved parties. In addition, it is recommended to more efficiently make use of the possibility to combine students from different educational backgrounds to involve more perspectives in developing new business models and to further support and stimulate the students in the ideation phase aiming at more innovative ideas.

The Fujifilm Future Challenge is already today open for several universities and with an international setup including universities from two countries. Further transferability and upscaling of the module is consid-ered possible in terms of including more students from different universities and more/other companies. An upscaling of the module would need well developed logistics but if successful it would increase the possibility to compare outcomes and experiences at a larger scale.

3.5   OVERVIEW OF TOOLS AND METHODS USED BY HEIS

The lecturers of the S4S-project-team have already used a lot of different tools in the three modules and are interested in using/ testing new tools and methods for green venturing in the S4S-project. An overview and a brief description of each tool or method can be found in Annex 1.

The methods and tools could be classified according to their applicability / usefulness in different phases of a venturing process and according to the target group for using the method or tool. A data base with a pool of innovative approaches and tools for collaborative green venturing will be developed in work pack-age 3.1 of the S4S-project.

3.6   CROSS-CASE INSIGHTS AND LEARNINGS

The evaluation of the three modules has shown that the approaches to collaborative green venturing differ slightly, but that the challenges and success factors are very similar. Overall, the results of the sur-veys are in line with the results of the interviews.

3.6.1 Cross-case-isnights

The following cross-case insights can be derived from the main evaluation categories.

Motivation and interest

Table 5: Cross-case insights - Motivation and interest

Students	Lecturers	Business Partners (UOL and VAS)
▪ Interest in a **high level** of **theory/ practice** transfer ▪ Interest in **sustainability**, **innovation** and **entrepreneurship** topics ▪ Interest in **new cooperation-formats** with companies and start-ups ▪ Module is part of the **curriculum**	▪ Promote **cooperation** between **students** and **business** ▪ Motivate students to **combine sustainability** and **entrepreneurship issues** in a new way ▪ Familiarise students with the challenges of sustainable entrepreneurship and business model development **as close to reality as possible**	▪ Student **support** is appreciated ▪ Students open up **new perspectives** for the business partners and bring in other **competences** in the project ▪ **Reflect strategies** and ideas with students ▪ **Out of the box**/ unconventional thinking by students

In all modules students are interested in new forms of cooperation with a high level of theory and practice transfer in the field of sustainability, entrepreneurship and innovation. Students appreciate the opportunity to work with companies, the combination of sustainability and entrepreneurship, the development of new competences and the experiences with a different teaching set-up. The lecturers are interested in establishing new formats and in demonstrating the challenges of sustainable entrepreneurship in practice. Business partners are especially interested in unconventional perspectives of the students. Start-ups and smaller companies are glad to receive support from students.

The activities

Table 6: Cross-case insights - The activities

Students	Lecturers	Business Partners (UOL and VAS)
▪ **Self-responsible learning** processes with a high work-load ▪ Getting to know tools and methods for **idea generation** and **business model development** ▪ **Focus** on the **learning process** with regard to ideation and/ or business model development ▪ **Company visits**	▪ Discussion of tools and methods in a **limited timeframe** ▪ **Creating** a good **learning atmosphere** with a combination of creativity, design thinking and business development tools ▪ Support of various teams with different tasks –**high workload** for lecturers ▪ Some modules are organised **like a small incubator** programme ▪ **Acquisition** and **support of partners** takes a lot of time	▪ Some interview partners **could not** immediately **remember** the exact project tasks/**activities** ▪ Providing ideas/ **challenges** that are **feasible for the students**

For the students the independent learning process is an important element of the module. They want develop many new skills and learn new methods. For them is sometimes difficult to get an overview of all the different activities and requirements in the module. The lecturers think that it is difficult to teach many aspects of green venturing in a limited amount of time. Therefore, some modules are organized like a small incubator program. It is interesting that some business partner could not remember the concrete activities in the module. However, they liked the results of the project.

Support/ role of lecturers

Table 7: Cross-case insights - Support/ role of lecturers

Students	Lecturers	Business Partners (UOL and VAS)
▪ Is evaluated positively, were perceived more **like coaches** ▪ Lecturers with **different** professional **backgrounds** ▪ **Coordination** between lecturers **could be improved** ▪ In some cases, the **support** by the lecturers **could be increased**	▪ Divide the **teaching** in the module **according to their competences** ▪ Some lecturers can benefit from their **own practical experience** ▪ **Encourage students** to think out of the box	▪ During the modules the business partners were in particular in contact with the students ▪ This makes it **difficult** for the business partners to **evaluate** the **support** provided by the lecturers

The students appreciate the fact that the lecturers have different professional backgrounds and act more like coaches. Some students express the need for a better support and coordination by the lecturers. The lecturers see themselves in the role of a learning coach and are interested in leading the students out of conventional thinking patterns. Especially at kickoff events and final presentations the business partners are in contact with the lecturers. This makes it difficult for them to assess the support of the lecturers.

Biggest Challenge

Table 8: Cross-case insights - Biggest Challenge

Students	Lecturers	Business Partners (UOL and VAS)
Time and **project management, teamwork** - Different **expectations** of **business partners** and **lecturers** **Selection** of the "best" **approach**, tool or method **Selecting** business ideas, models and **solutions** **Identification with** the **project** idea	- Conveying **a lot of content** in a limited time - Different **expectations** of **students** and **business partners** - Linking **practical orientation** and **scientific standards** **Integration** of more **sustainability-oriented tools** - Challenges for **student**s: **Time** management - Find **solutions** or strategies that are really **helpful for** the **business partners** **Idea** generation must be **realistic** and **innovative** **Competences** and **skills** in the field of sustainability are **heterogeneous**	- Development of a concrete and **solvable task** for the **students** **Remain open** to questions, ideas and solutions provided by students - In some cases, **lecturers** do not **support students** sufficiently - Translate technology and business know-how into **simpler terms** that can be understood by all **students**

For the students, time and project management are the biggest challenges. The selection of appropriate methods and the coordination of the interests of lecturers and business partners also represent challenges for students. In a module with a high amount of practical elements it is not always easy for the lecturers to teach the necessary scientific basics. Business partners are sometimes unable to assess the skills of the students. This makes it difficult for them to develop a solvable task for the student teams.

Assessing the module

Table 9: Cross-case insights - Assessing the module

Students	Lecturers	Business Partners (UOL and VAS)
▪ **Strengths**: e.g. strong practical relevance, work on (existing) business models, promotion of teamwork ▪ **Weaknesses**: e.g. time management, integration of sustainability-related tools and methods, matching of the competencies in the individual project teams, high workload, more focus on practical implementation	▪ **Strengths**: e.g. combination of students' new perspectives with the experiences of established or newly founded businesses, module could give an additional motivation for starting a business ▪ **Weaknesses**: par time character of the modules – students have other tasks/ modules, matching process for the student teams could be improved, overview of tools and methods, integration of sustainability-oriented tools and methods	▪ **Strengths**: e.g. student teams are highly motivated, some student teams would even work like a new team in the company/ start-up, great degree of openness by lecturers and students ▪ **Weaknesses**: Practical and analytical students are not often in the same team, in some modules there is a trade-off between competition among the student teams and the learning processes

The students appreciate the practical relevance, but criticize that the implementation of the projects is not part of the modules. Lecturers criticize the matching process for the student teams in all modules. The business partners like the high motivation of the students, but also express criticism regarding the distribution of competences in the individual teams.

Outputs and outcomes

Table 10: Cross-case insights - Outputs and outcomes

Students	Lecturers	Business Partners (UOL and VAS)
▪ **Awareness** of the **challenges** associated with activities in the context of innovation, sustainability and entrepreneurship ▪ The **learning process** in the context of business model development ▪ **Knowledge acquisition** and the **application** of new tools and methods	▪ Outputs and outcomes for **students**: 　▪ **Experience** in self-organizing in a team, project management, business experience, improving presentation skills 　▪ **Idea-evaluation-process**, classification and application of tools and methods for business model development 　▪ **Assessing the usefulness** of individual methods 　▪ **Students might** consider to **become an entrepreneur**	▪ Are often **satisfied** with the results ▪ In some cases, **contact** with **students was maintained** after the end of the module (Thesis, former students are working in the company) ▪ Business partner is sometimes **still working on the business idea** ▪ Improved **reputation** for the business partner

In terms of outputs and outcomes, it is interesting to note that students do not necessarily consider the output to be significant, for example in terms of a new business model. For them, the outcome in terms of the learning process is in some cases more important. Some students considered the module important for their study progress as well as for their job choice and career. The development of skills and competences is also an essential outcome for the lecturers. For the business partners the module is sometimes a component of employer branding activities. In addition, sometimes a follow-up of the project results is also carried out.

Impacts

Table 11: Cross-case insights – Impacts

Students	Lecturers	Business Partners (UOL and VAS)
▪ The project ideas, if implemented, could **contribute** to the **SDGs** in the **long term** ▪ Impacts of the projects are limited, **learning process** could have a **positive impact in the long run**, because students would expand their competences ▪ The projects **promote interest** in **venturing**, which could lead to a positive impact in the long run. ▪ Interviewees have **not** yet **identified** any **direct impact** on their **own career**	▪ Perhaps **students** will pay more **attention** to **sustainability** issues in their careers and in their private lives. ▪ **None** of the interviewees **measure** the **long-term impacts** of the module so far ▪ **Increased employability** of students	▪ It is **difficult to assess** the impact of the module ▪ Projects could **indirectly contribute** the **SDGs**

For all target groups it is difficult to assess the impact of the modules. The modules have more of an

indirect and long-term impact: for example, through an increased interest in sustainability and venturing, which can influence students' career or business decisions.

It was also difficult for all target groups to assess the impact of individual projects. The survey did not provide a clear picture either. The impacts are generally assessed as positive. The environmental impact is often rated higher.

3.6.2 Cross-case learnings

The following cross-case learning can be derived from the overall evaluation.

Motivation and interests of participants

- Ensuring practical relevance by facilitating the integration of the modules into the regional innovation systems

- The practical relevance is of great importance for the students and a significant motivation factor for all target groups. However, the integration of business partners is very time-consuming. Therefore, the question arises whether the modules can be integrated even better into the regional innovation system in order to reduce the acquisition effort. The modules could be integrated into the regional innovation- and start-up-ecosystem in such a way that a pool of business partners and ideas is systematically embedded in order to reduce the regular preparation effort.

- Establishment of a systematic evaluation of motivation and interest regarding sustainability, entrepreneurship and innovation

- Students, lecturers and business partners are interested and motivated to learn more about sustainability, entrepreneurship and innovation. The question arises to what extent the motivation and the development of competences can be assessed before and after the module.

Key persons and promotors

- High expenditure of time for lecturers, students and business partners

- Is the amount of time invested adequate and justified? One common challenge is to balance the cost-benefit ratio. In many cases there are only few students per lecturer in the respective module. One approach could be to systematically evaluate the benefits and impacts of the modules.

- High importance of personal commitment and limited resources for long-term provision of the formats

- The success of all modules depends besides interested students very much on the high commitment of the lecturers and other partners. In all modules the initiators and the other lecturers are the driving forces. In some cases, the commitment is not seen in the universities. This means that without the current lecturers the modules would no longer be provided. How can the existing and new modules be maintained and institutionalized in the long term?

Drivers, barriers and success factors

- The modules focus on the learning process

- The open setting is a driver to try out different methods with a relative low risk of failure and also to reflect on learning experiences. But it is also a barrier when students assume that their ideas are probably not going to be developed further.

- Enhancing challenged-based learning

- A lot of the activities in the modules are challenge-based. Challenge-based learning can be enhanced in the modules as it is a fairly new area. Starting up a module based on challenges is usually not difficult, but grading can be a challenge.

- Integration into existing curricula and balancing the workload

- In some cases, new teaching formats are difficult to integrate into existing curriculum. There is also the question regarding the type of exam and the adequate workload for the module compared to other modules.

- Knowledge barriers

- Sometimes students have knowledge gaps regarding the products or services of the business partner. For example, technology-driven business models can be overwhelming for some students

Unique Elements

- Unique selling proposition of the modules motivates to participate

- The combination of (sustainability) challenges and topics of ideation and business model development is not yet adequately covered by other modules

- Lecturers take on different roles in the modules

- Interdisciplinary teams have an expert role when it comes to scientific backgrounds and the introduction of tools and methods in the areas of sustainability and entrepreneurship. Lecturers also act as coaches who support the student-teams with their different experiences and competences.

Need for improvement

- Dissemination strategy

- The modules have several elements of a unique selling proposition. In some cases, the USP is not used in the external communication. The question arises how to contribute to the dissemination of such formats?

- Transferability and scalability

- Transferability and scalability depends a lot on the people involved. Furthermore, the modules are very resource-intensive, which makes transferability and scalability difficult. Therefore, it should be examined to what extent the modules can be more standardized Standardization could be facilitated, for example, by using more web-based learning.

- Student teams - matching process

- Which competences and skills should be present in the teams? How can such skills and competencies be identified and how can the matching process be organized? It is about matching student teams, but also about matching students and companies or entrepreneurial challenges

- Students are sometimes challenged by the variety of tools, methods and approaches

- How can the number of tools, methods and approaches be limited? To what extent and how can students be supported in selecting tools, methods and approaches? What are appropriate teaching and learning materials?

- Grading

- One possibility is to work with formative assessments (both the process and the product). Is it possible to develop a method for a systematic formative assessment? Formative assessment could include an assessment by the business partners.

Outcomes and impacts

- Alignment of the module activities with the SDGs

- In general students participating in the modules are very interested in sustainability. However, the SDGs are not always highlighted in the modules. Students have difficulties to evaluate/assess the potential impact of their business ideas in relation to the SDGs. Is it possible to develop a tool for this?

- Long-term impact research

- The impact of the modules on the students' careers and on the business ideas/ models has not yet been examined: long-term analysis as a new field of research. The question arises with which research approach the impact can be evaluated.

4 Guidelines for the evaluation of collaborative student-business venturing activities

THE SCALEUP4SUSTAINABILITY-PROJECT

The Erasmus+ Project "ScaleUp4Sustainability: Innovative Programmes for Student-Business Collaboration in Green Venturing (S4S)"[5] develops new, innovative approaches and tools for teaching and learning sustainable entrepreneurship and collaborative Green Venturing with universities and business partners in Germany, Sweden and the Netherlands. These forms of collaborative Green Venturing are embedded in bachelor and master programmes of Higher Education Institutions and are organized and coached by professors and teaching staff. Collaborative Green Venturing represents an innovative form of multidisciplinary, real problem-based interactive learning and entrepreneurship education. The S4S-project has developed a new approach for the evaluation of collaborative student-business venturing activities. In this guideline the main steps are summarised.

TARGET GROUP: WHO IS THE MANUAL AIMED AT?

Teaching staff and company managers, responsible for the design, planning and implementation of collaborative student-business venturing activities.

OBJECTIVES: WHAT IS THE PURPOSE OF THE MANUAL?

This manual supports formative evaluations/assessments of a specific type of teaching and learning which is focused on the collaboration of students and business partners in developing sustainable business ideas.

There is a clear need to upscale approaches of university support for sustainable entrepreneurship and to introduce and diffuse new forms of student-business collaboration in developing and implementing environmental innovations and starting new green businesses. We refer to this activity as „Green Venturing". Venturing is an integral element of entrepreneurship and emphasizes the creation of new business within an organization (new products or business units) or outside an organization (spin-offs, start-ups). With "green" we refer to the concept of a Green Economy[6] and the notion of a triple bottom line, which seeks to generate economic benefits with products, services and processes that are beneficial for society and the natural environment.

The objectives of this manual are:

- It helps to make the costs and benefits as well as the outputs, outcomes and impacts of student-business collaboration schemes transparent

- It supports the identification of strengths and weaknesses of existing teaching and learning schemes in this field

- It provides insights and data for the improvement of existing schemes and modules in sustainable entrepreneurship and green venturing

- It stimulates innovative new learning units, modules or programmes in sustainable entrepreneurship and collaborative student-business venturing

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[5] Project Number 601150-EPP-1-2018-1-DE-EPPKA2-KA / Duration 01.11.2018-31.10.2021: See https://www.scaleup4sustainability.eu (Accessed on 25 May 2020).

6 See https://ec.europa.eu/environment/basics/green-economy/index_en.htm (Accessed on 25 May 2020).

CONCEPTUAL FRAMEWORK AND KPIs: HOW CAN THE EVALUATION BE FRAMED?

The evaluation investigates how collaborative venturing between students and businesses and the different forms of knowledge spill-overs they create can foster sustainable entrepreneurship that impacts sustainable (regional) development. Given the key role of universities, which are often non-profit organizations, and the emphasis on ultimate impacts, the evaluation can be based on the theory of change which serves a prominent programme evaluation role in the non-profit sector (Carman, 2010; Funnel & Rogers, 2011). The theory of change draws on defining linear cause and effect chains from programme implementation to societal impact (McLaughlin & Jordan, 1999). It assumes a linear causality between inputs, activities, (immediate) outputs, outcomes and impacts. Although this linear causality is rather a simplification of reality, it helps to reach the objectives of the programme evaluation:

- Input: What resources are dedicated to a particular teaching programme or module (workload of teaching personnel, students, business partners, time, equipment, funding etc.)?

- Activities: The thing the module does with the inputs and resources provided. The activities can be considered interventions that are aimed at bringing intended change.

- Outputs: Direct products of the activities in the module, often expressed in terms of units of service or number of people served.

- Outcomes: Positive and negative effects on target groups (students, business partners, teaching personnel) caused by the activities and outputs, direct change in knowledge, attitude, values or behaviours.

- Impacts: They describe the contribution that the outcomes have beyond the target group, in the larger system, e.g. on the market, on society and, on the environment. Impacts can be positive and negative, intended and unintended. For example, on the impact level environmental benefits like the reduction in greenhouse gas emissions resulting from an environmentally friendly product or service of a new green venture which has participated in a collaborative student-business venturing exercise are measured. Next to environmental indicators also economic indicators (e.g. jobs created in a specific region) or social indicators (e.g. solved problems of customers) should be considered in regard to the impact dimension. The effects on the impact level can be seen as a result of the improved performance of a company that has participated in a collaborative green venturing exercise.

Figure 22: Conceptual framework for the evaluation of collaborative student-business venturing
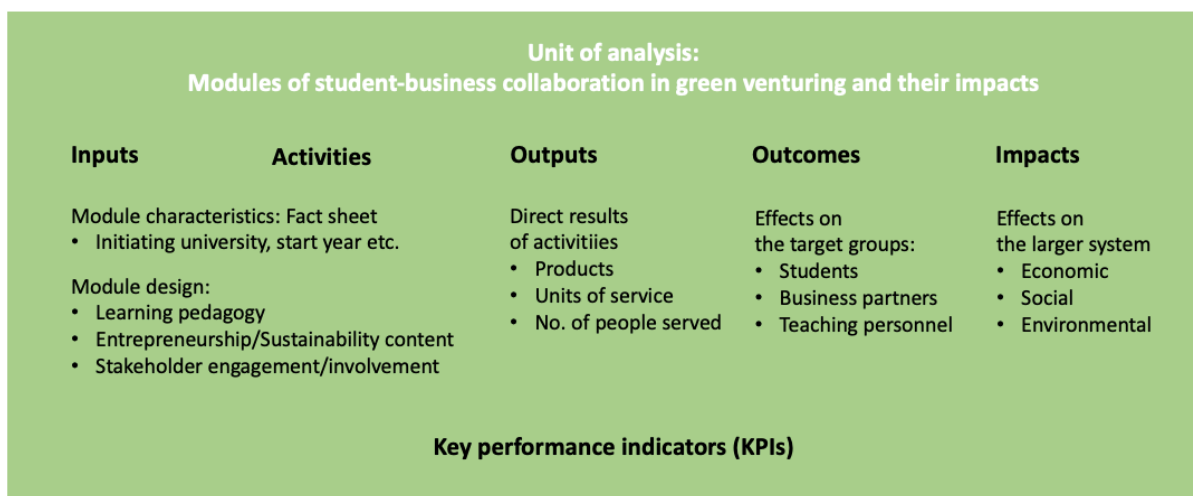
GUIDING EVALUATION QUESTIONS

- What are the interests and motivations of participants (teaching personnel, students, business part-ners) and other stakeholders (e.g. central staff of the university)?

- Who have been the key persons/promoters in setting up and implementing the module?

- What have been the success factors, drivers and barriers for the implementation of the module?

- Are there any unique elements in the design and implementation of the module?

- What are the strengths and weaknesses of the module?

- Is there a need for improving and expanding existing modules or programmes?

- To what extend are the modules scalable and transferable to other programmes and units of the uni-versity, to other HEIs and regions?

- What are the outputs, outcomes and impacts of the modules, how effective are they?

KEY PERFORMANCE INDICATORS: HOW TO MEASURE THE EFFECTIVENESS OF A MODULE?

Key performance indicators (KPIs) are helpful to assess, measure and manage teaching programmes and single modules. Therefore, the evaluation should use selected KPIs to assess existing modules of stu-dent-business-collaboration. It seems useful to cluster the KPIs according to the theory of change along-side the effect chains from programme implementation to impacts on the larger system.

The development of useful KPIs is an iterative process. You should start with defining some selected KPIs prior to the first investigation. The first evaluation generates insights on the usefulness of selected KPIs and on the need to use additional KPIs. Table 1 displays examples of KPIs that can potentially be used in the evaluation.

You should be aware of the fact that reliable data for KPIs on outcomes and impacts is hard to obtain. Nevertheless, you should explore to what extent data are available and how they can be related to the activities and outputs of collaborative green venturing. It is likely that you cannot measure outcomes and impacts precisely, but you should try to assess the linkage between activities and outputs on the one hand and outcomes and impacts on the other hand by using ordinal scales, e.g. from "no contribu-tion" to "very high contribution".

Table 12: Examples of KPIs, which can be used in the evaluation of collaborative green venturing

Input	Activities	Output (direct results of activities)	Outcomes (effects on target groups)	Impact (effects on the larger system)
- Teaching personnel: Total workload for preparing, implementing and follow-up of the module (in hours) - Students: Actual workload/working hours in relation to the credits points of the entire module - Business partners: Total workload for preparing and implementing the module	- Total no. of teaching personnel and number of universities/professorships involved - Total no. of participating students (incl. background and education level) - Total no. of business partners involved (possible characterizations: age, size of companies FTE, sales, branches) - No./ percentage of (sustainable-oriented) methods and tools used for collaborative green venturing - Number of used (green) tools and methods for green venturing - Number of direct interactions student-business/ use of collaboration tools	- Degree of satisfaction of students, business partners, teaching personnel - Degree of improvement of entrepreneurship / sustainability competencies - Increase of entrepreneurial spirit by students - Increase in interest to start a green business (in the long run) - Number of significantly improved green business ideas or elaborated business models	- President, deans, no. of professors who rate the module as "very important" for the university - No. of business partners with significantly improved performance (after 1, 2, 3 years) - No. / percentage of venture ideas still persued or on the market - No. / percentage of students or business partners who rate the module to be important for their career/ their business - No. / percentage of students who have an increased level of interest in innovation and/or entrepreneurship and/or sustainability - No. / percentage of students who work in a green venture / started their own green business - No. / percentage of students who started their own (green) business - No. / percentage of teaching personnel who is highly motivated and interested in collaborative green venturing	Economic - No. of jobs created by business partners 1, 2 or 3 years after the module Social - Number of significant contributions to social SDGs - Number of people served Environmental - Reduction in greenhouse gas emissions by sold green products/ services - Number of significant contributions to environmental SDGs

LEVEL AND SCOPE OF EVALUATION: HOW TO USE THE MANUAL EFFECTIVELY?

It is important to clarify the purpose and context of the evaluation first. Basically, three levels and scopes of evaluating a module of collaborative student-business venturing can be distinguished:

- *Focal picture (Lean evaluation)*: The evaluation is focused on students and selected business partners and is limited to selected Output KPIs and selected Outcomes KPIs. This lean-type evaluation is useful each time the module is conducted. It supports continuous improvement.

- *Larger picture (Medium evaluation)*: The evaluation comprises all groups directly involved in the module (students, business partners, teaching personnel) and uses Input, Output and Outcomes KPIs. This type of evaluation is useful for medium-term revisions of the module (e.g. every three years) and helps to identify strengths and weaknesses and module efficiency.

- *Full picture (Extensive evaluation)*: The evaluation comprises all groups directly involved in the module (students, business partners, teaching personnel) as well as relevant stakeholders (e.g. head of educational programmes, transfer offices, top-management of involved business partners). It comprises Input, Output, Outcomes as well as Impact KPIs. This type of extensive evaluation is useful for a fundamental revision of a module or programme, e.g. for the preparation of re-accreditation or strategic discussions for the redesign of existing or the development of new modules and programmes.

PROCEDURE: WHICH STEPS TO GO?

(1) Decide on the level and the key purpose of the evaluation

(2) Collect key facts: Update or revise the fact sheet /syllabus

(3) Collect data on KPIs:

Lean evaluation: Investigate outputs and outcomes using selected KPIs, surveys and feedback exercises

Medium evaluation: Additionally, investigate inputs and efficiency of the module

Extensive evaluation: Additionally, other relevant stakeholders and collect data on impacts

(4) Assess strengths and weaknesses and need for improvement and redesign

(5) Develop measures for improvement

(6) Implement improvement measures and/or fundamentally redesign the module/programme

TOOLS FOR EVALUATION: WHICH TOOLS AND METHODOLOGIES ARE HELPFUL AND AVAILABLE?

The methodologies and tools for evaluation were developed and tested in the S4S project. An evaluation toolkit and a report on the evaluation of leading approaches and tools in collaborative Green Venturing are available on the S4S project website: https://www.scaleup4sustainability.eu.

Table 13: Tools for evaluation of modules for student-business collaboration

Level and scope of evaluation	Scope: Actors involved	Effects covered	Fact sheet	Survey	Competence Progress Assessment	Interviews
Focal picture	Students and selected business partners	Outputs, selected Outcomes	Produced or updated	Evaluation questionnaire for students		
Larger picture	All groups directly involved (students, teaching staff, business partner staff)	Input, Output, Outcomes	Produced or updated	Evaluation questionnaire for students and business staff	Questionnaire „Sustainable Entrepreneurial Competencies"	
Full picture	All groups directly involved (students,	Input, Output,	Produced	Evaluation question-	Questionnaire „Sustainable	Interviews with selected students, business

	teaching staff, business partner staff), plus relevant stakeholders	Outcomes, Impacts	or updated	naire for students and business partners	Entrepreneurial Competencies"	partners, teaching staff and stakeholder
Available tools			Fact sheet template	Template "Modul evaluation questionnaire for students"	Template for Questionnaire „Sustainable Entrepreneurial Competencies"	Interview guidelines for students, teaching personnel, business partners Code list for coding student interviews, lecturer interviews and business partner interviews

SOURCES OF AVAILABLE EVALUATION TOOLS

Evaluation toolkit	Source
Fact sheet template	https://www.scaleup4sustainability.eu/toolkit/
Questionnaire „Sustainable Entrepreneurial Competencies"	https://www.scaleup4sustainability.eu/toolkit/
Interview guidelines for students	https://www.scaleup4sustainability.eu/toolkit/
Interview guidelines for teaching personnel	https://www.scaleup4sustainability.eu/toolkit/
Interview guidelines for business partners	https://www.scaleup4sustainability.eu/toolkit/
Code list for coding student interviews	https://www.scaleup4sustainability.eu/toolkit/
Code list for coding lecturer interviews	https://www.scaleup4sustainability.eu/toolkit/
Code list for coding business partner interviews	https://www.scaleup4sustainability.eu/toolkit/
Modul evaluation questionnaire for students	https://www.scaleup4sustainability.eu/toolkit/

Data base of methods and tools for collaborative green venturing	https://www.scaleup4sustainability.eu/toolkit/

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ANNEX 1: LIST OF METHODS AND TOOLS ALREADY IN USE/INTERESTED IN USING

University of Oldenburg (UOL)

Linköping University (LiU)

Vennebroek Academic Services (VAS)

Tools/ methodologies already in use

- Action based learning (LiU)
  Type of pedagogic – see CDIO Syllabus

- Alliance game (VAS)
  Serious game: simulation of 21-century skill 'collaborating'; Selection of business partners; Elements: strategy formulation, new venturing, pitching, speed dating. Evaluation afterwards.

- Business Model Canvas (UOL, VAS, LiU)
  A business model framework by Osterwalder & Pigneur (Business model generation, 2009)

- Business plan template (LiU)
  A template with business plan content that connects all tools used in the course to sections in a business plan. Business plans are used as final report in entrepreneurship courses.

- Co-venturing between students/ entrepreneurs (UOL)
  Under the guidance of the team of lecturers, the participants work together with selected business partners to promote sustainable start-up ideas which are supposed to be economically successful and contribute to environmental and climate protection.

- Competence inventory team (LiU)
  Form to make inventory of skills in the group

- Course manual for students (UOL)
  A checklist for the successful participation of the module

- Creativity technics (VAS)
  Lego Serious Play and brainstorm

- Design Thinking (LiU and VAS)
  - This is at tool that is under development (LiU)
  - Customer validation of new 'green' value propositions (VAS)

- E-learning (LiU)
  We use an Office 365-based platform named Lisam.

- Ecotonos Game (VAS)
  Serious game: simulation of 21-century skill: cross-cultural communication; Simulation of mono- and multicultural collaboration. Evaluation afterwards

- Entrepreneurship game (VAS)
  Example: Fujifilm Future Challenge

- Flipped Classroom pedagogics – e.g. video lectures as complements etc. (LiU)
  FC is an activity-based pedagogic style based on actions that take place before, during and after a teacher lead occasion. I.e. students have to prepare before a lecture and work after.

- **Frankelius twist (LiU)**
  Methodology to develop business ideas if the technology is known – i.e. tech push perspective

- **Group contract (LiU)/Project plan**
  To enhance group work, we let the students create group contracts where they agree on how to work.

- **Insights discovery (VAS)**
  Improving individual and team effectiveness using personal assessment. Drivers, blockers of behavior. How to deal with 'difficult' people and situations

- **Interview Guide Market analysis (LiU)**
  Tool for gaining customer feedback

- **Joint projects with companies through master thesis (LiU)**
  Joint master thesis projects. Master thesis ideas collected and presented in a Master thesis event at University together with including companies (Master thesis Day)

- **Kalles squares (LiU)**
  Tool to enhance creativity

- **Learning Community (VAS)**
  Sharing results and bottlenecks between students; Open ICT system for several Universities; Different structure of classes: preparation in advance, personal ownership of learning process, self-starting teams; Element of 'flipped classroom' techniques

- **Lego Serious Play (LSP) to enhance creativity and inclusion (VAS and LiU)**
  - Serious game: simulation of 21-century skill: Creativity (VAS)
  - Her we are inspired by Lego Serious Play and we use lego to enhance creativity, visualize ideas and to make equal distribution of space for individuals to talk, i.e. enhance the group dynamics (LiU)
  - Comparison of LSP with brainstorm techniques (VAS)
  - Developing new ideas to solve SDG's (VAS)

- **Life Cycle Assessment (LiU)**
  Students work with one product in a LCA perspective and suggest two new ideas to lower the env. impact, they also identify implementation problems and suggest how to deal with them.

- **Market positioning diagram (LiU)**
  Tool for positioning – workshop material for marketing seminar.

- **NABC - Need, Approach, Benefit, Competition (LiU)**
  NABC is developed by Carlson & Wilmot (SRI, 2006) and is a tool to develop business ideas.

- **Negotiation games (VAS)**
  Serious game: simulation of 21-century skill 'collaborating'
  Dyadic exercises in buying/selling ('distributive negotiation') related to personality and cultural intelligence. Evaluation afterwards.

- **Online Tool Pool (LiU and UOL)**
  Value chain analysis, Porters Five Forces, Eco-Quick-Check, Guidelines: Sustainable Assessment of start-ups

- **Outline by business partners: idea, expectations (UOL)**
  A template for the business partners in the eco-venturing module to describe their project idea (during scouting process due to selection process)

- Own online content (www.start-green.net/tools) (UOL)
  Overview of tools for a sustainability-oriented business model development incl. further information, literature references, explanatory videos

- PEST & PESTEL (LiU and UOL)
  Tools for business intelligence and environmental analysis

- Pitch training WS and pitch crafting material (LiU)
  To be able to present ideas are crucial. Therefore, seminaries in pitch technology is given. We have also developed templates for how to craft a good pitch.

- Pitches by business partners: business idea (UOL)
  Business partners present their business idea in a 10-15 minutes pitch.

- Porters five forces (LiU and UOL)
  Based on the HBR-paper from 2008 on industry analysis by Porter "The five forces that shape strategy". We have developed a canvas and a seminar.

- Project management (LiU)
  Several project-based courses includes project management, where students have to conduct project planning, following up and reports.

- Qualtrics (VAS)
  A quantitative research software with many possibilities used for research-based learning education programmes and marketing

- Resource Inventory (LiU)
  A workshop based on the paper of Brush et al (2001) "From idea to unique advantage…", which has been operationalized into a resource puzzle built upon different type of resources. The seminar draws upon the paper and upon theories of the resource based view, e.g. Penrose (1959)

- Scouting for Agtech business venturing ideas (LiU)
  To add relevance we prefer to keep the context of our courses close to our research. The work of students can thereby benefit business development in selected areas.

- Scouting for green business venturing ideas (UOL)
  Searching for and evaluating suitable start-up and innovation concepts for Eco-Venturing, contact with business partners/founders, selection according to economic and ecological criteria

- Serious Behavioral games: speed dating pitch (VAS)
  Part of the 'Alliance Game"

- Serious Gaming (VAS)
  Simulation of practical situation, learning-by-doing. Evaluation afterwards. Element of 'flipped classroom' techniques

- Shitty Prototyping (LiU)
  This is a design seminar where students build and visualize their solutions, concepts and ideas. It is rapid and follows a restricted form which ends with reflection. Craft boxes are used.

- Speed dating tool (VAS)
  element of alliance game

- Study visits to companies (LiU)
  Study visits at companies belonging to a course relevant area

- Sustainability Assessment (UOL)
  A Manual for the sustainability assessment of start-ups - a practical tool for start-up teams, investors and funding organizations (Trautwein, C., Fichter, K. 2018#9

- Sustainable Business Canvas (UOL)
  The Sustainable Business Canvas serves as a foundation for the systematic development of sustainability-oriented business models in the context of an interactive workshop (Tiemann, I., Fichter, K. 2016)

- SWOT (LiU and UOL)
  Tool for analysis on internal factors, e.g. strengths and weaknesses and external factors, e.g. threats and opportunities

- Team coaching (UOL)
  A team of lecturers from two chairs supports the students intensively

- Value Creation Forum (LiU)
  VCF is an interactive seminar which is originally invented by SRI. We have developed the tool further to fit the classroom. In VCF we work with roles, Positive, constructive, investor & customer. Roles are marked with colored hats. The presenting groups present their early idea following the NABC and illustrated on a poster. The class comments and gives suggestions from their roles orally and on colored post-its.

- Value Proposition Canvas (UOL)

- Based on the use of the sustainable business canvas (see above), students sometimes use the value proposition canvas provided by Osterwalder et al. (2014)

Tools/ methodologies interested in using/ applying

- Atlas.ti (VAS)
  qualitative research software

- Back Casting (LiU)
  A method that starts with defining a desirable future and then develops several steps that will connect that specified future to the present

- Challenge Pitch
  An idea provider (e.g. business partner) presents a sustainability-related innovation or business challenge and asks for solutions by students

- Common student-business-workshops (design thinking) (UOL)
  Based on design thinking approach

- Ex-ante ex-post questionnaires for participating students (UOL)
  The use of questionnaires for collecting data on the participating students, their motivation and the effects of participating in the module

- Feasibility analysis (LiU)
  Following the literature on business development we teach students to analyze their ideas regarding to technology, market, organization and profitability. Furthermore, sustainability dimensions are added.

- Impact assessment of co-venturing student-business (UOL)
  Tools for evaluating the effects of co-venturing exercises

- More interdisciplinary teams (LiU, UOL)
  Combine students from different programs, in projects and/or courses

- Problem Based Learning (LiU)
  Students learn about a subject through the experience of solving an open-ended problem found in trigger material

- Sustainability Assessments (not Ad hoc) (UOL)

ANNEX 2: TEMPLATE FOR FACT SHEETS

Factsheet Student/Business cooperation in green venturing S4S

Status: 11 March 2019

Module **in general**

Title of module	
Initiating university:	
Start year	
End year / ongoing	
No. of modules held	
Duration (weeks)	
ECTS:	
Module objective(s):	
Phases & activities (in key-words only)	
No. of business projects so far:	
No. of business partners so far:	
No. of students so far:	

Balance involvement between Business / Student:
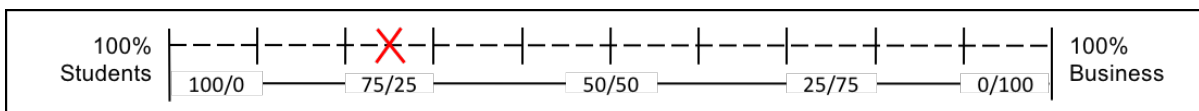
```
100%    ┤───┤───┤─X─┤───┤───┤───┤───┤───┤───┤    100%
Students  100/0      75/25       50/50       25/75      0/100   Business
```

Student involvement per module

(Characteristics of students typically included in the module)

No. of students:	
Level of students	Bachelor level ☐ Master level ☒ PhD level ☐
Background students	Technical; Managerial; Environmental; mostly Sustainability

	Economics and Management			
	☐	☐	☐	☐
No. of universities/ professor-ships involved:				
Number of Faculties involved:				

Business involvement per module

(Characteristics of business partners typically included in the module)

No. of companies/ venture teams/ start-up teams:		
Age of business partners	Pre-seed (1-3 months): Seed (4-12 months): Start-up (1 year): 1st Stage (1-3 years): 2nd Stage (4-6 years): 3rd Stage or later (>6 years):	☐ ☐ ☐ ☐ ☐ ☐
Size of companies FTE (no. of companies)	Single entrepreneur: Venture team (<5 employees): Micro enterprise (5-10 employees): Small (10-25 employees): Medium (25-250 employees): Large (>250 employees):	
Size of companies sales (no. of companies)	None Small (<1mln €) Medium (1-10€) Large (>10€)	
Typical Branches (no. of com-panies)	Industry Services Government Not for profit ☐ ☐ ☐ ☐	

Sustainability items covered

People issues (social)	Yes/no

Planet issues (sustainable)	Yes/no
Profit issues (business)	Yes/no
keywords of sustainable subjects covered (max 10)	

Personal assessment (qualitative)

Which activities & methods have been effective:	Which improvements could be made:
Main outcomes of the module	

ANNEX 3: GUIDELINES FOR EXPLORATIVE INTERVIEWS WITH STUDENTS

Give a brief introduction to the aims and background of the interview

Explain what we do with the interviews and its results

Underline that the interview is anonymous and that privacy / data protection is guaranteed

Ask whether the interview can be recorded

- Interviewer
- Date of interview
- Location of interview / telephone/Internet interview
- Duration of interview

General Questions

- What do you do for a living?
- Does sustainability and entrepreneurship play a role in your daily life or study? If so: can you give some examples
- What was/ is your subject of study? Which master-program did you attend?
- When did you attend the module?

Motivation and interest

- Was the participation compulsory or voluntary? If voluntary, why did you participate in the module?
- What were your expectations?
- Have you been interested in sustainability (or sustainability-oriented business model development) before the module?
- Have you been interested in entrepreneurship before the module?

Experiences and competencies before

- Have you had experiences with entrepreneurship/ starting-up a business before the module?
- Have you had experience with sustainability issues before?
- Which content/ former knowledge that you gained at university (before the module) was helpful for your project?

The activities

- What venture idea did you work on?
- What was your project target? Which tasks you did you have?
- Was there a business partner involved? I so, who was it?
- How big was the team you worked in?
- What methods and tools have you used during your project?

- Support of lecturers: What role did they play?

- What was your biggest challenge during the module?

- What knowledge would have been helpful? Was this content part of the module? If yes – how was it taught? If not – where did you get the input?

Assessing the module

- What is unique about the module?

- What are the strengths and weaknesses of the module?

- What could or should be improved in the module?

- What could be improved in the university-support system for (sustainable-) entrepreneurship?

- Do you think the module can be scaled up for more students and transferred to other HEIs?

Outputs and outcomes

- What was the result of your project?

- How important are these results for the business partner? What do you think?

- Has the module changed your attitude towards entrepreneurship? If yes, how?

- Has the module changed your attitude towards sustainability? If yes, how?

- Has the module changed your entrepreneurial competencies? If yes, how?

- Has the module changed your attitude towards sustainability issues?

- What was the most important learning outcome/ experience?

- Has the module influenced your further career/ personnel development? E.g. your thinking, competencies, topic of master thesis, (part-time) employment at the business partner (during or after your studies), Plans of starting-up a business.

Impacts

- To your knowledge, has the project you worked on or other projects in the module have had a positive or negative effect on society or the natural environment?

- E.g. in regard to job creation?

- E.g. in regard to environmental benefits such as reductions in greenhouse gas emissions?

- E.g. in regard to social effects?

- Do you think that the projects of the module actually contribute to the Sustainable Development Goals (SDGs). If yes, how?

Thank you very much for your time and participation!

ANNEX 4: GUIDELINES FOR EXPLORATIVE INTERVIEWS WITH BUSINESS PARTNERS

Give a brief introduction to the aims and background of the interview

Explain what we do with the interviews and its results

Underline that the interview is anonymous and that privacy / data protection is guaranteed

Ask whether the interview can be recorded

- Interviewer
- Date of interview
- Location of interview / telephone/Internet interview
- Duration of interview

General Questions

- What is your role or function in the company?
- How long have you been working in the company?
- Does sustainability play a role in your professional life? If so: can you give some examples
- Does entrepreneurship play a role in your professional life? If so: can you give some examples

Motivation and interest

- Why did your company participate in the Eco-Venturing module / Fujifilm future challenge / in the module Environmentally Driven Business Development?
- Who took the initiative and the decision to participate?
- What were your expectations?
- Have you been interested in sustainability (or sustainability-oriented business model development) before the module?
- Have you been interested in entrepreneurship before the module?

Experiences and competencies before

- Have you had experiences with entrepreneurship/ starting-up a business before the module?
- Have you had experience with sustainability issues before?
- Which content/ former knowledge that you gained in your education or professional lifebefore the module was helpful for your project?

The activities

- What venture idea or challenge did you provide for the module / challenge?
- What was your project target?
- How big was the student team that worked on your venture idea or challenge?
- What methods and tools have they used during your project?

- Support of lecturers: What role did they play?

- What was the biggest challenge during the module?

- Was the knowledge and competencies of the students and lecturers sufficient to tackle the project properly? If no, what did you miss?

Assessing the module

- What is unique about the module/challenge?

- What are the strengths and weaknesses of the module/challenge?

- What could or should be improved in the module/challenge?

- What could be improved in the university-support system for (sustainable-) entrepreneurship?

- Do you think the module / challenge can be scaled up for more students and business partners and transferred to other HEIs?

Outputs and outcomes

- What was the result of your project?

- How important are these results for your company?

- Has the participation of your company in the module/challenge changed your attitude towards entrepreneurship? If yes, how?

- Has the module /challenge changed your attitude towards sustainability? If yes, how?

- Has the module changed your entrepreneurial competencies? If yes, how?

- What was the most important learning outcome/ experience?

- Has the module /challenge influenced your further career/ personnel development?

Impacts

- To your knowledge, has the project with the students/university have had a positive or negative effect on society or the natural environment?

- E.g. in regard to job creation?

- E.g. in regard to environmental benefits such as reductions in greenhouse gas emissions?

- E.g. in regard to social effects?

- Do you think that the project results contribute to the Sustainable Development Goals (SDGs). If yes, how?

Thank you very much for your time and participation!

ANNEX 5: GUIDELINES FOR EXPLORATIVE INTERVIEWS WITH LECTURERS

Give a brief introduction to the aims and background of the interview

Explain what we do with the interviews and its results

Underline that the interview is anonymous and that privacy / data protection is guaranteed

Ask whether the interview can be recorded

- Interviewer

- Date of interview

- Location of interview / telephone/Internet interview

- Duration of interview

General Questions

- What is your role or function in the university?

- How long have you been working with the university?

- Does sustainability play a role in your professional life? If so: can you give some examples

- Does entrepreneurship play a role in your professional life? If so: can you give some examples

Motivation and interest

- What has been your role in the module / challenge?

- Who took the initiative to set up the module / challenge?

- Why do you participate in the module / challenge as a lecturer?

- Have you been interested in sustainability (or sustainability-oriented business model development) before the module / challenge was initiated?

- Have you been interested in entrepreneurship before the module was initiated?

Experiences and competencies before

- Have you had experiences with entrepreneurship/ starting-up a business before the module?

- Have you had experience with sustainability issues before?

- Which content/ former knowledge that you gained in your education or professional life before being a lecturer in the module was helpful for the module / challenge?

The activities

- What are the most important methods and tools which are taught and applied in the module / challenge?

- What role did you play in the module / challenge?

- What have been the biggest challenges during the module/s / challenge/s?

- Was the knowledge and competencies of the students and business partners sufficient to tackle the project properly? If no, what did you miss?

Assessing the module

- What is unique about the module/challenge?

- What are the strengths and weaknesses of the module/challenge?

- What could or should be improved in the module/challenge?

- What could be improved in the university-support system for (sustainable-) entrepreneurship?

- Do you think the module / challenge can be scaled up for more students and business partners and transferred to other HEIs?

Outputs and outcomes

- What are the main results of the module / challenge?

- How important are these results for the students?

- How important are these results for business?

- Has the module /challenge changed the attitude of students towards sustainability? If yes, how?

- Has the module changed the entrepreneurial competencies of students? If yes, how?

- What was the most important learning outcome/ experience for you as a lecturer?

Impacts

- Do you track or measure the long-term impacts of the module / challenge? If yes, how?

- What are the most important impacts of the module / challenge?

- E.g. in regard to job creation?

- E.g. in regard to environmental benefits such as reductions in greenhouse gas emissions?

- E.g. in regard to social effects?

- Do you think that the project results contribute to the Sustainable Development Goals (SDGs). If yes, how?

Thank you very much for your time and participation!

ANNEX 6: CODE LIST FOR CODING STUDENT INTERVIEWS

Student

- Living (What do you do for a living?)
- Role sustainability (profession, life or study)
- Role entrepreneurship (profession, life or study)
- Subject of study
- Time of participation (When did you attend the module?)

Motivation and interest

- Reason for participation
- Expectations
- Interest in innovation before module
- Interest in sustainability before module
- Interest in entrepreneurship before module

Experiences and competencies before

- Experiences with innovation before
- Experiences with entrepreneurship before
- Experiences with sustainability before
- Content/ knowledge helpful for project

Activities

- Venture idea
- Project target
- Project tasks
- Business partner involved
- Student team
- Methods and tools used
- Support of lecturers (positive, negative)
- Biggest challenge
- Helpful knowledge in project
- Knowledge taught
- Knowledge input for project

Assessing the module

- Uniqueness of module

- Strength of module

- Weakness of module

- Need for improvement in module

- Need for improvement in support system

- Scalability and transferability of module

Outputs and outcomes

- Result of project

- Importance of results for business partner (high, low)

- Attitude towards innovation (change of attitude, confirming attitude)

- Attitude towards entrepreneurship (change of attitude, confirming attitude)

- Attitude toward sustainability (change of attitude, confirming attitude)

- Entrepreneurial competencies (change of entrepreneurial competencies, confirming entrepreneurial competencies)

- Learning outcome/ experience

- Influence on career/ personnel development (yes, no)

Impacts

- Effect on society

- Effect on natural environment

- Effect job creation

- Contribution SDGs (yes, no)

ANNEX 7: CODE LIST FOR CODING BUSINESS PARTNER INTERVIEWS

Business partner

- Function in the company

- Role sustainability (profession)

- Role entrepreneurship (profession)

Motivation and interest

- Reason for participation

- Initiative for participation

- Expectations

- Interest in innovation before module

- Interest in sustainability before module

- Interest in entrepreneurship before module

Experiences and competencies before

- Experiences with innovation before

- Experiences with entrepreneurship before

- Experiences with sustainability before

- Content/ knowledge helpful for project

Activities

- Venture idea

- Project target

- Size of the student team

- Methods and tools used

- Support of lecturers (positive, negative)

- Biggest challenge

- Sufficient knowledge of students

- Sufficient knowledge of business partners

Assessing the module

- Uniqueness of module/ challenge

- Strength of module/ challenge

- Weakness of module/ challenge

- Need for improvement in module/ challenge

- Need for improvement in support system/ challenge

- Scalability and transferability of module/ challenge

Outputs and outcomes

- Result of project

- Importance of results for business partner (high, low)

- Attitude towards innovation (change of attitude, confirming attitude)

- Attitude towards entrepreneurship (change of attitude, confirming attitude)

- Attitude toward sustainability (change of attitude, confirming attitude)

- Entrepreneurial competencies (change of entrepreneurial competencies, confirming entrepreneurial competencies)

- Learning outcome/ experience

- Influence on career/ personnel development (yes, no)

Impacts

- Effect on society

- Effect on natural environment

- Effect job creation

- Contribution SDGs (yes, no)

ANNEX 8: CODE LIST FOR CODING LECTURER INTERVIEWS

Lecturer

- Function in the university
- Role sustainability (profession)
- Role entrepreneurship (profession)

Motivation and interest

- Role in the module/ challenge
- Initiator of the module/ challenge
- Reason for participation in the module/ challenge
- Interest in innovation before module/ challenge
- Interest in sustainability before module/ challenge
- Interest in entrepreneurship before module/ challenge

Experiences and competencies before

- Experiences with innovation before
- Experiences with entrepreneurship before
- Experiences with sustainability before
- Content/ knowledge helpful for project

Activities

- Tools and methods applied in the module/challenge
- Support activities of lecturers
- Biggest challenge
- Sufficient knowledge of students
- Sufficient knowledge of business partners

Assessing the module

- Uniqueness of module/ challenge
- Strength of module/ challenge
- Weakness of module/ challenge
- Need for improvement in module/ challenge
- Need for improvement in support system
- Scalability and transferability of module/challenge

Outputs and outcomes

- Result of project
- Importance of results for students (high, low
- Importance of results for business partner (high, low)
- Attitude of students toward sustainability (change of attitude, confirming attitude)
- Entrepreneurial competencies of students (change of entrepreneurial competencies, confirming entrepreneurial competencies)
- Learning outcome/ experience of students
- Learning outcome/ experience of lecturers

Impacts

- Measurement of the long-term impacts of the module / challenge
- Important impact of the module/ challenge
- Effect on society
- Effect on natural environment
- Effect job creation
- Contribution SDGs (yes, no)

ANNEX 9: QUESTIONNAIRE FOR STUDENTS

1. Which year did you attend the module?

2. Which program did you attend of which the module was part?

3. Why did you participate in the module?
   (Specify importance for each statement: Extremely important/Very important/Somewhat important/Not so important/Not at all important/Don't know)
   - Develop new competence
   - Experience a different teaching set-up
   - The module was compulsory
   - The combination of sustainability and entrepreneurship
   - The possibility to collaborate with companies
   - Other reason (please specify)

For question 4-11, specify interest (Extremely interested/Very interested/Somewhat interested/Not so interested/Not at all interested/Don't know)

4. What was your level of interest in sustainability before taking the module?

5. What was your level of interest in sustainability after taking the module?

6. What was the level of your interest in entrepreneurship before taking the module?

7. What was your level of interest in entrepreneurship after taking the module?

8. What was the level of your interest in innovation before taking the module?

9. What was your level of interest in innovation after taking the module?

10. What was your level of interest in sustainable entrepreneurship before taking the module?

11. What was your level of interest in sustainable entrepreneurship after taking the module?

12. How many students in total were in your project group developing the business idea?

13. How was the diversity in educational background in your project group?
    - A great deal (each student from a different program)
    - A lot
    - A moderate amount
    - A little
    - None at all (all students from the same program)
    - Don't know

14. Respond to the following statements in connection to the module (strengths and weaknesses)

    (Specify for each statement: Extremely high/Very high/Somewhat high/Not so high/Not at all high/Not relevant/Don't know)
    - Connection between the lectures and the project work

- Connection between module content and exam[7]
- Connection between module credits and workload
- Connection between tools and methods and project tasks
- Possibility to think freely and differently
- Inspiration from guest lectures
- Commitment of teachers
- Practical relevance of the module
- Synergies from teamwork

15. Which were the most helpful methods and tools that you used in the module? Rank up to five methods from 1 most useful to 5 least useful.[8]

16. What was the outcome of your project in the module? Please select all relevant aspects.
    - Increased personal competence
    - New Business idea
    - New Business model
    - Improved Business model
    - Business Model is not feasible[9]
    - Launch of a Start-up
    - Thesis in cooperation with a business partner
    - Employment at a business partner
    - Other (please specify)

For question 17-19, specify interest (Extremely important/Very important/Somewhat important/Not so important Not at all important/Not relevant/Don't know)

17. How important was the module for the progress of your study (e.g. selection of other modules)?

18. How important was the module for your job choice and career?

19. (If applicable) How important were the outcomes of your project for the business partners?[10]

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[7] For surveys sent to the students from the Fujifilm Future Challenge (VAS) this statement was not included as it was not relevant. For surveys sent to the students from the Eco-Venturing module (UOL) the word „Prüfungsleistung" was added as clarification.

[8] For surveys sent to the students from the Fujifilm Future Challenge (VAS) the students were asked to rank up to three methods. For surveys sent to the students from the Eco-Venturing module (UOL) the students were asked to rank five methods of the following: Business Model Canvas, Co-venturing between students/ entrepreneurs, Course manual for students, Eco-Quick-Check, Guidelines: Sustainable Assessment of start-ups, PESTEL, Porters Five Forces, Portfolio Analysis, Project Plan /Project Management, Start-Green Online Tools (Start-green.net/tools), Study visits to companies, Sustainability Assessment, Sustainable Business Canvas, SWOT, Team coaching, Value Chain Analysis, Other (please specify).

[9] This alternative was not included in the survey sent to students form the Fujifilm Future Challenge (VAS).

[10] For surveys sent to students from the Environmental Driven Business Development (LiU) this question was not included.

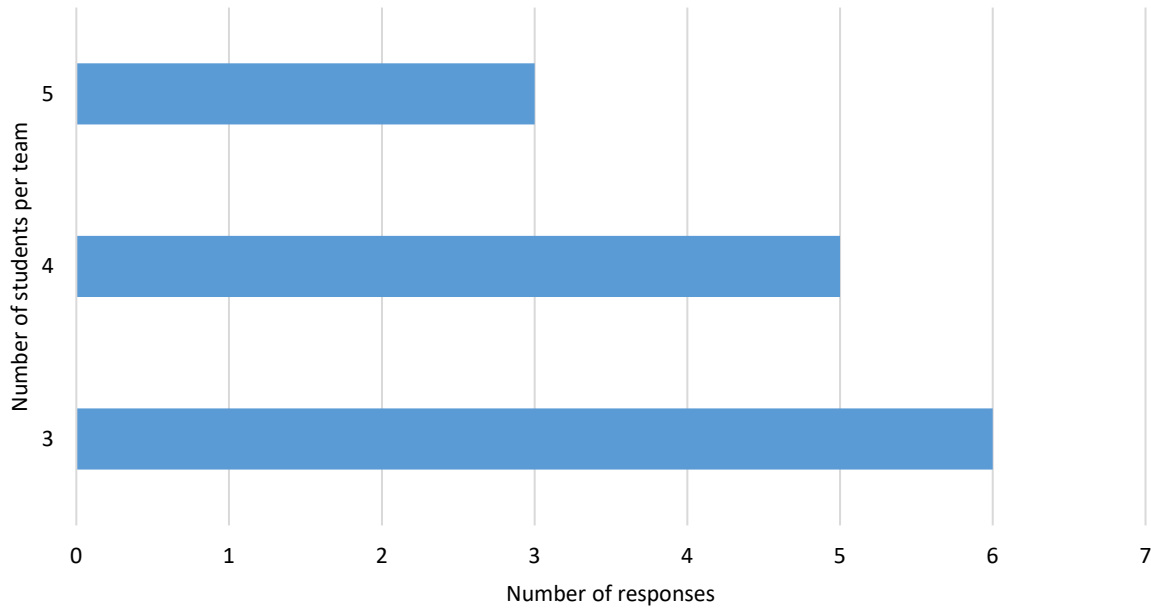## ANNEX 10: ADDITIONAL RESULTS FROM THE STUDENT SURVEY REGARDING THE MODULE ECO-VENTURING (GERMANY)

Figure Annex B: Compilation of the results from Q12 How many students in total were in your project group developing the business idea?
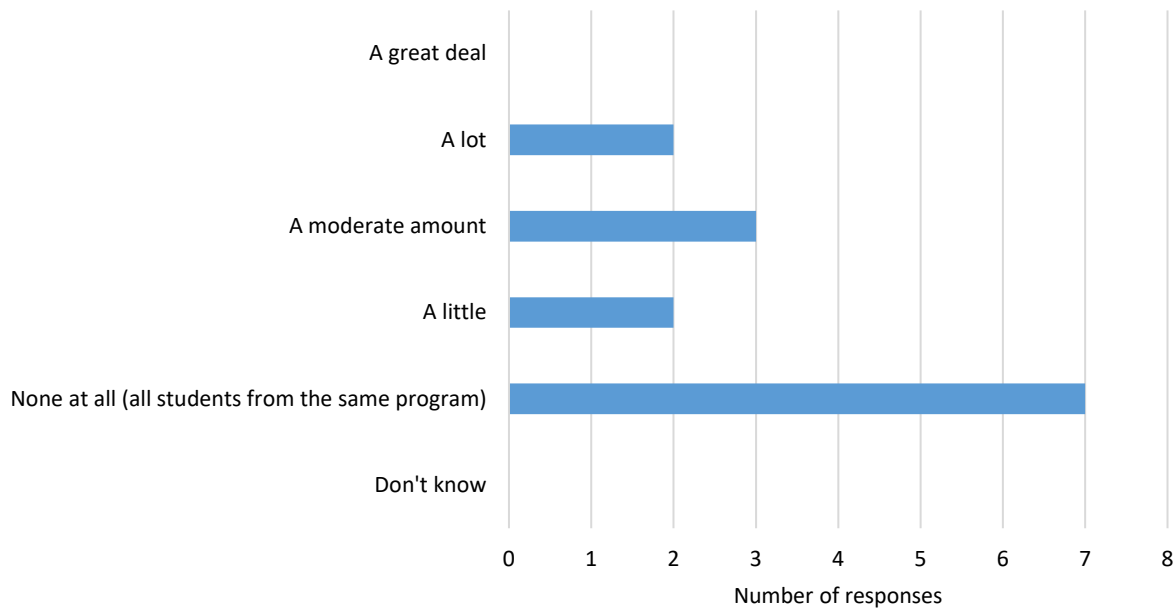

Figure Annex A: Compilation of the results from Q13 How was the diversity in educational background in your project group?
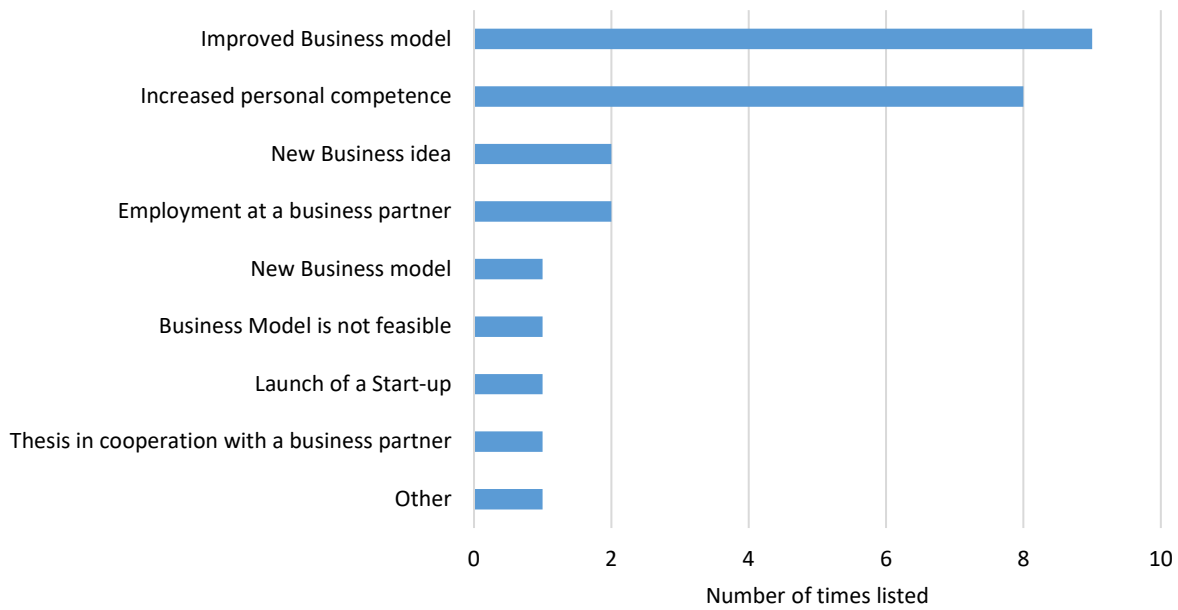
Figure Annex C: Compilation of the results from Q16 What was the outcome of your project in the module? Please select all relevant aspects.
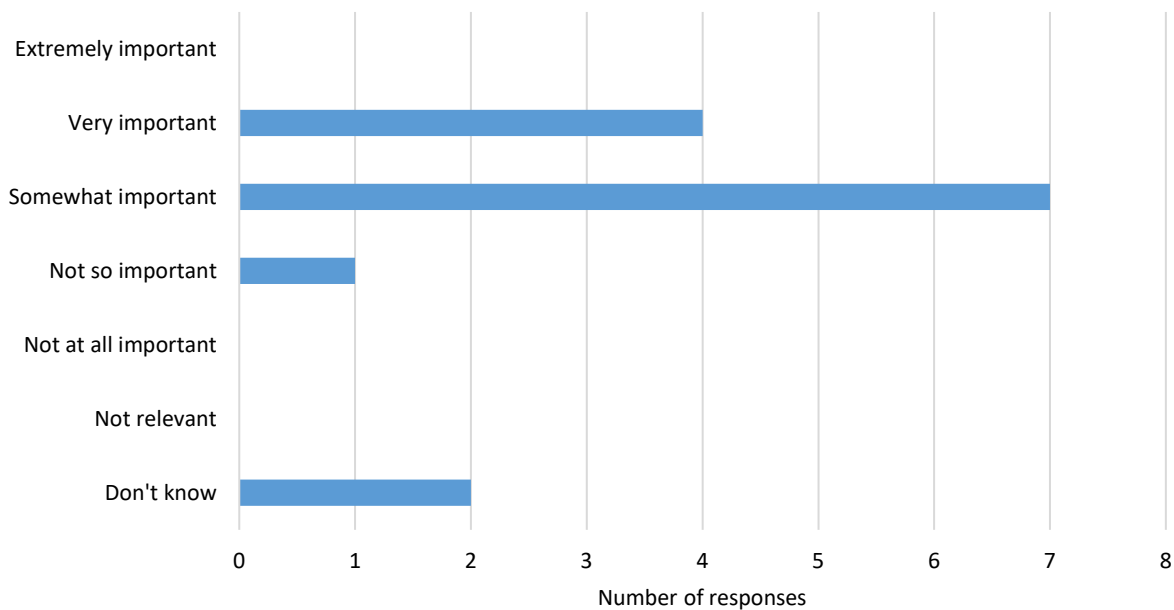
Figure Annex D: Compilation of the results from Q19 (If applicable) How important were the outcomes of your project for the business partners?

Table Annex A: Compilation of the suggested improvements of the module (Q21)

- Less differences between the supervision and evaluation styles of the different chairs
- I really liked the module and I learned a lot. Especially getting to know different companies with innovative ideas beside the own project partners was very inspiring! I think the workload was a bit too high for 6 CP, but all the organisation and concept of the module was very well developed.
- More official presentation of results in front of company partners.
- More advise by the lecturers would be needed and a bigger commitment by the project partners in interaction with the project group. Some additional guest lecturers or entrepreneurs would be exciting.
- Cooperating with more than one company. Lot of people didn't choose the class this term because only one partner company does exist. For SEM Student the Business idea development was cancelled which also has an impact on the interest in this course since now the innovation management and eco-venturing are both mandatory if the specialization is aimed for. The initial project plan was more work that it did actually help. The ECTS don't fit the workload - making it two semesters would be way more fitting. Don't get me wrong I enjoyed the class and did learn - especially the communication between company and the lecturers - but there is a lot that needs improvement.
- I would have liked more support of the teachers when handling problems with the business partner. Our business partner often let us wait for information and forgot meetings, didn't have much time etc. This made work for us much harder, even though it was his lack of professionality.
- Longer timeframe, better credit workload relation.
- (1) Teachers should make sure that the workload provided by the business partner should be reasonably feasible by the project group and that workload across all project groups is fairly equal in order to be able to compare performance across groups and make sure no project group is overloaded or underloaded with tasks that may in the end affect their mark. (2) Teachers should provide more detail on their evaluation of the students' project report and work with them on the report more closely. Teachers' expectations of the report should be formulated in more detail to students. The teachers' evaluation of the project report should be routinely discussed with the whole project group.
- Better communication on the teacher level. Better connection between workload and credits.
- More time for input and practice of the tools within lectures. More feedback from lectures and time to improve within the lecture setting. More group work within a lecture time and feedback from students. More time to see in face-to-face meetings the improvement / process of students.

ANNEX 11: ADDITIONAL RESULTS FROM THE STUDENT SURVEY REGARDING THE MODULE ENVIRONMENTALLY DRIVEN BUSINESS DEVELOPMENT (SWEDEN)
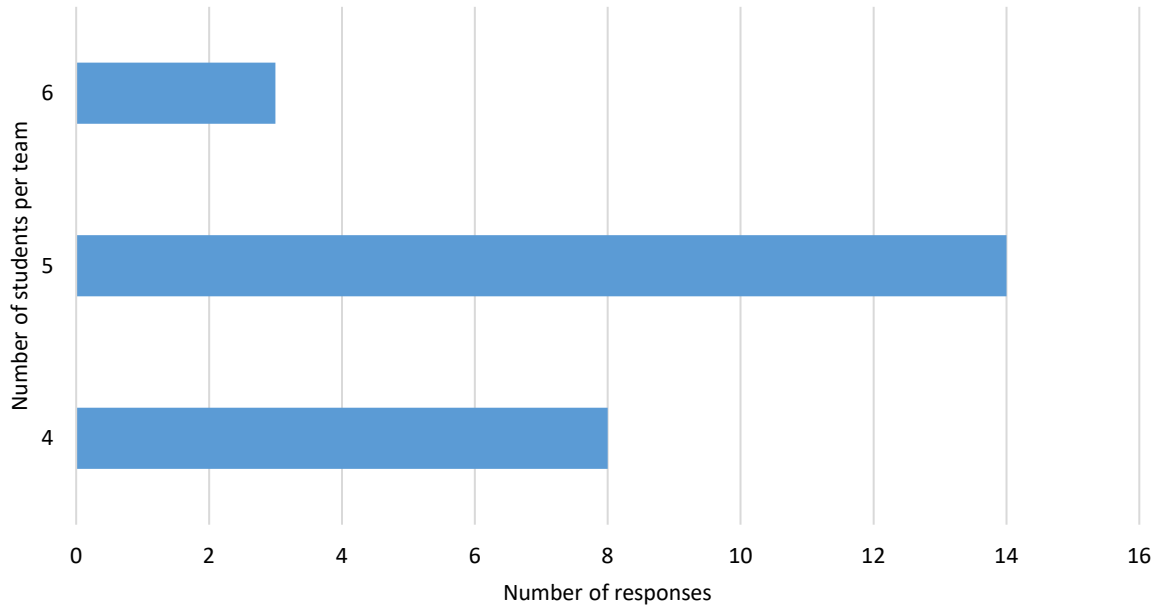

Figure Annex F: Compilation of the results from Q12 How many students in total were in your project group developing the business idea?
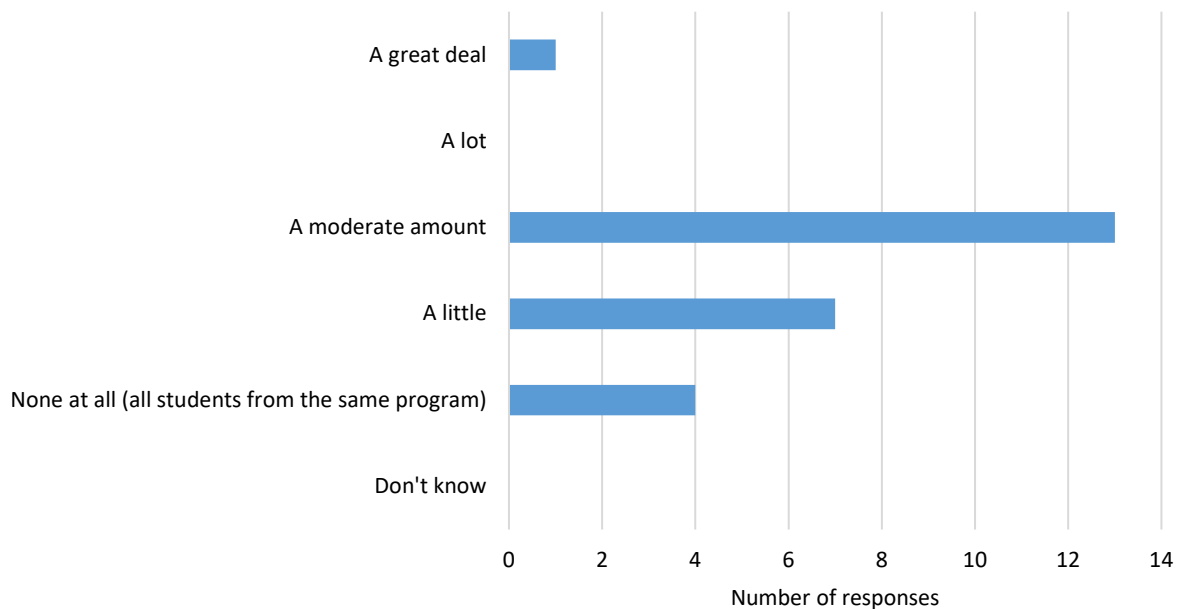

Figure Annex E: Compilation of the results from Q13 How was the diversity in educational background in your project group?
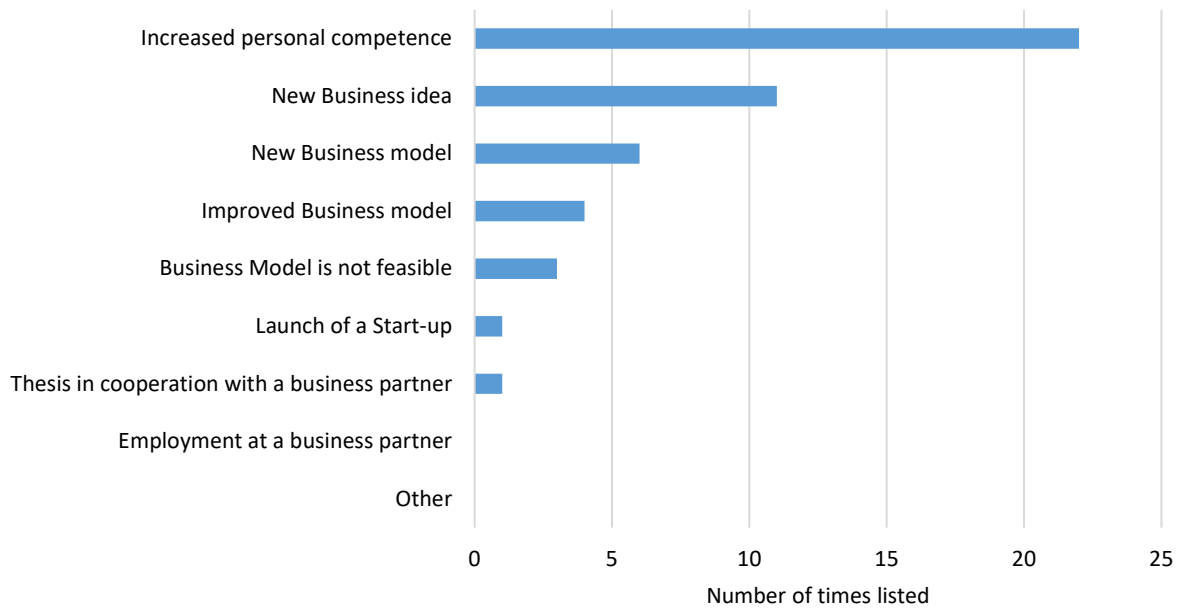
Figure Annex G: Compilation of the results from Q16 What was the outcome of your project in the module? Please select all relevant aspects.

Table Annex B: Compilation of the suggested improvements of the module (Q20)

- Additional business coaching (the one given was greatly appreciated).
- Look at Stanford's course for launching start-ups and maybe put more emphasis on launching and business structure than just planning.
- Increased contact with other start-ups and businesses!
- Grades on the group work and not on the exam, test/quiz would have fit better than exam.
- Provide study materials to use before the exam! I learned all the models brought up in the course because I thought they were the focus for the exam. However, there were no models, but a lot of other things that you may have mentioned once but which could not be read in a book etc. as important to know.
- Helping students that want to develop their idea further, after the end of the module. This was not the case for us; therefore, I don't know how this worked for students that wanted to develop their idea further. Therefore, this is just an idea that might not be relevant.
- More connection to other companies.
- Sustainable Business Development could mean more than just start-ups. My memory of the module was that it was a bit too focused on entrepreneurship/start-ups as the only way to drive business development. I would have liked to see more of analysing, redefining existing business models to outline pain points and opportunities and build from that. The project felt a bit forced, at least to our group. However great with the different partners and guest speakers and I do remember the module quite well.
- Check with other courses so that not the same modules gets repeated. A lot is taken up in marketing courses.

- More lectures from external business people.
- Less focus on the tools for business ideas etc. which you learn in marketing. Involve companies and do projects in collaboration with companies instead.
- I think the module could have benefited from even more (or more intense) cooperation and discussion between project groups during the project - it was very rewarding for the project and for me personally. Also a collective brain storming session where groups could share ideas, since I understood that some project groups had difficulties finding an exciting new business idea for the project.
- Make more things mandatory to spur students to come to the scheduled lectures and workshops. I would not say I skipped a lot of sessions in the course but now that I look back on the course and many others I wish there would have been some more force making sure I did not let laziness get the best of me...
- For EMM students taking the master sustainable business the module overall is to re- petitive. The Projects needs to be overseen. Overall, it's fun and Learning to work with students with different study background. This doesn't mean the course itself is bad, i like the commitment of the course leader.
- I always feel that these types of management courses involve a great amount of differ- ent models to analyze your idea, company, business model, strengths, weaknesses, value proposition, etc. through, which makes it all sort of messy. Maybe the university could try to make more use of the existing business support/innovation system connec- tions to for example LEAD business incubator, which place a lot of focus around the market verification with NABC which requires that you actually go out and speak to peo- ple) and then developing the BMC. If one can get a better understanding of how the potential start-up/idea journey can evolve over time with formulating and hypothetical NABC -->verifying it in meetings and thereafter creating your value proposition and BMC I think the course can get more of that real feeling around it. Also maybe include some people from for instance Almi, Lead, Unitalent, LiU Innovation, LIAF, InGenious, etc. in some sort of panel for the final presentation so that you can get some feedback from people coming from the business sector.
- Focus more on the "environmentally driven", much was similar to, for example, Indus- trial Marketing / Service Development. Don't really know how this would be done but one thing I thought was difficult was that we felt a little "stuck" with a pretty bad idea that we came up with in a hurry at the beginning, and that it lowered the motivation slightly when we were supposed to refined that idea through all the steps and methods. But as I said, I don't really know how it could be prevented.
- A lot of repetition from previous courses, like Industrial marketing. Would have been better to do more of a deep dive into more specifics and not repeat basics from previous courses.
- Try to start from a higher level. Have some prerequires like industrial marketing, indus- trial economics, innovation management, environmental technology. That way the course can start right on with "new things" where perhaps old knowledge is combined but not too much repetition like I thought it was when I went the course. Would like some that were more "financially" oriented. Perhaps hard to do it for your own business idea but for example a lab where you do that for another more concrete example so you later can do it better for your own business idea?

ANNEX 12: ADDITIONAL RESULTS FROM THE STUDENT SURVEY REGARDING THE MODULE FUJIFILM FUTURE CHALLENGE (THE NETHERLANDS)
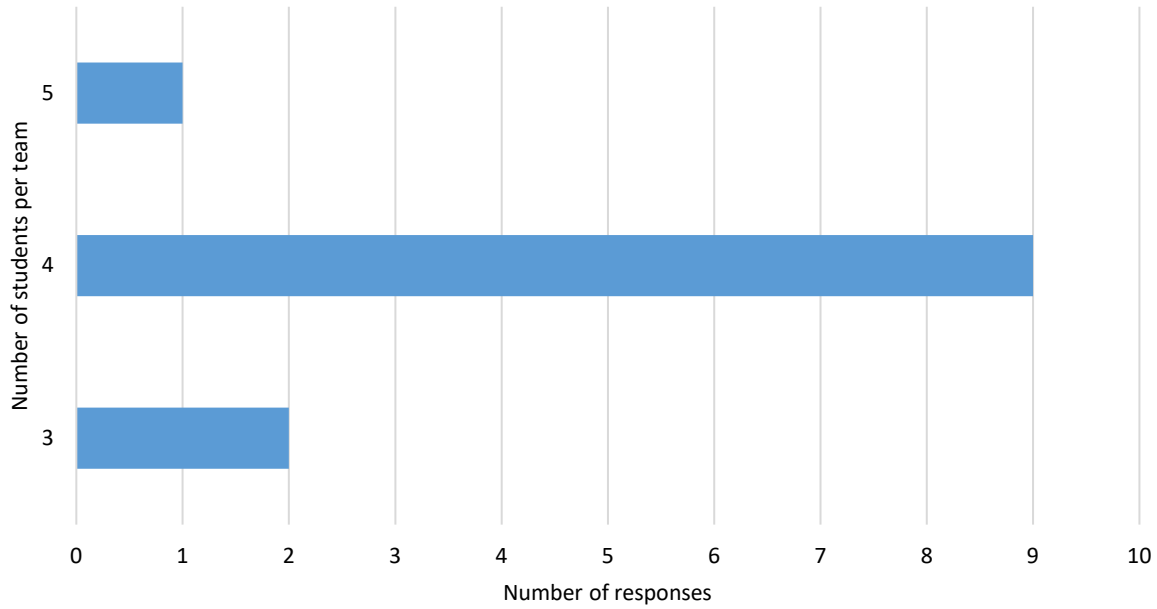

Figure Annex I: Compilation of the results from Q12 How many students in total were in your project group developing the business idea?
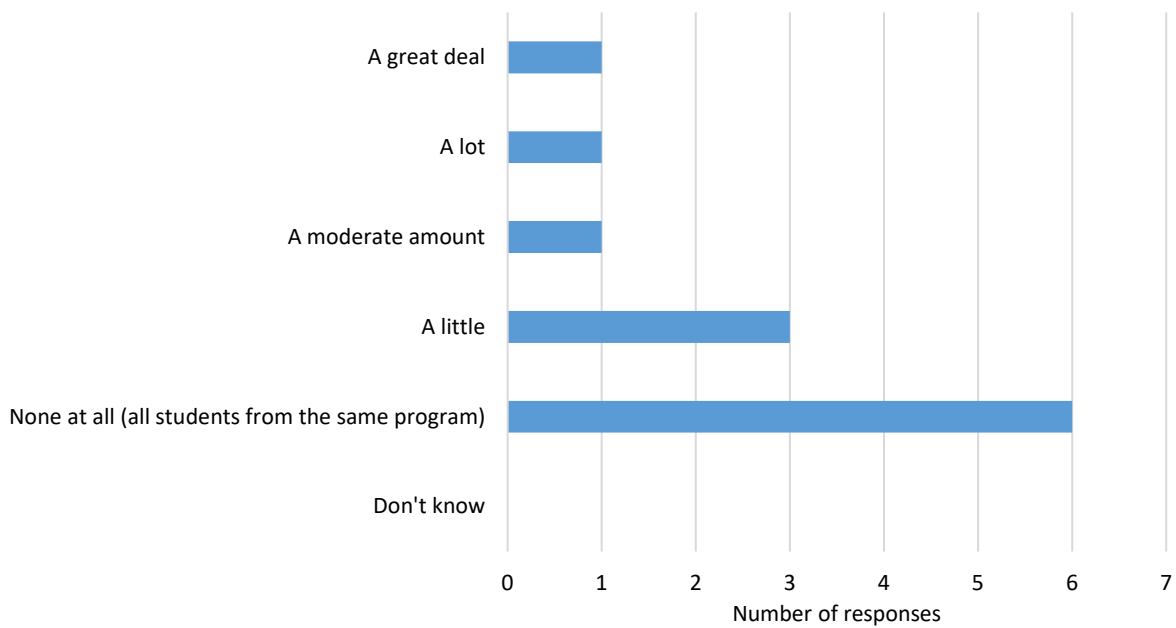

Figure Annex H: Compilation of the results from Q13 How was the diversity in educational background in your project group?
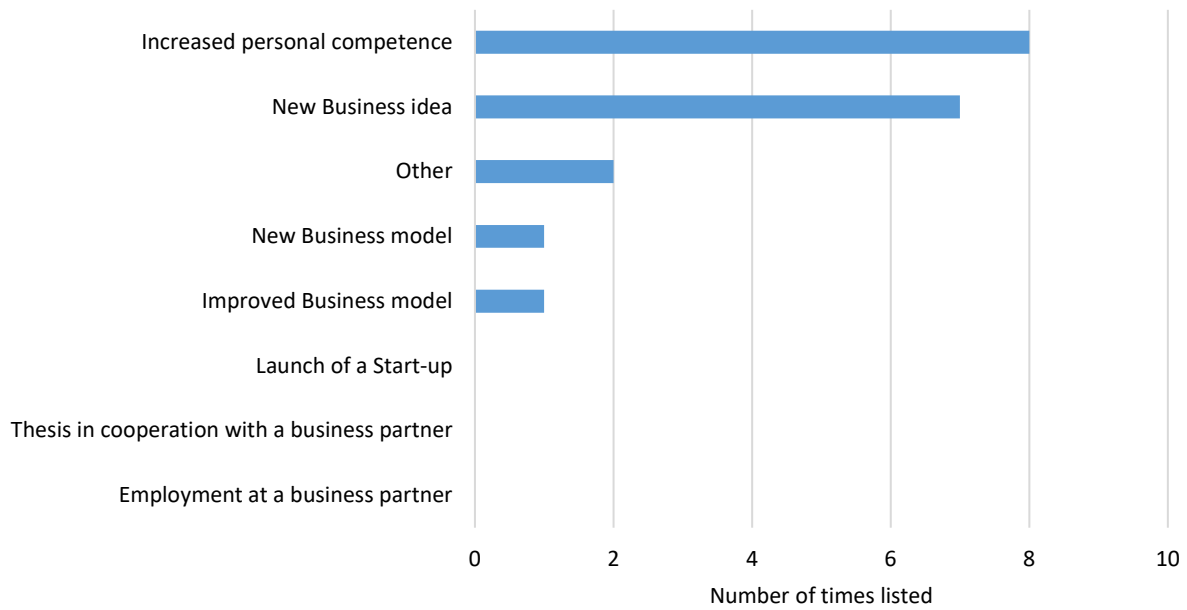
Figure Annex K: Compilation of the results from Q16 What was the outcome of your project in the module? Please select all relevant aspects
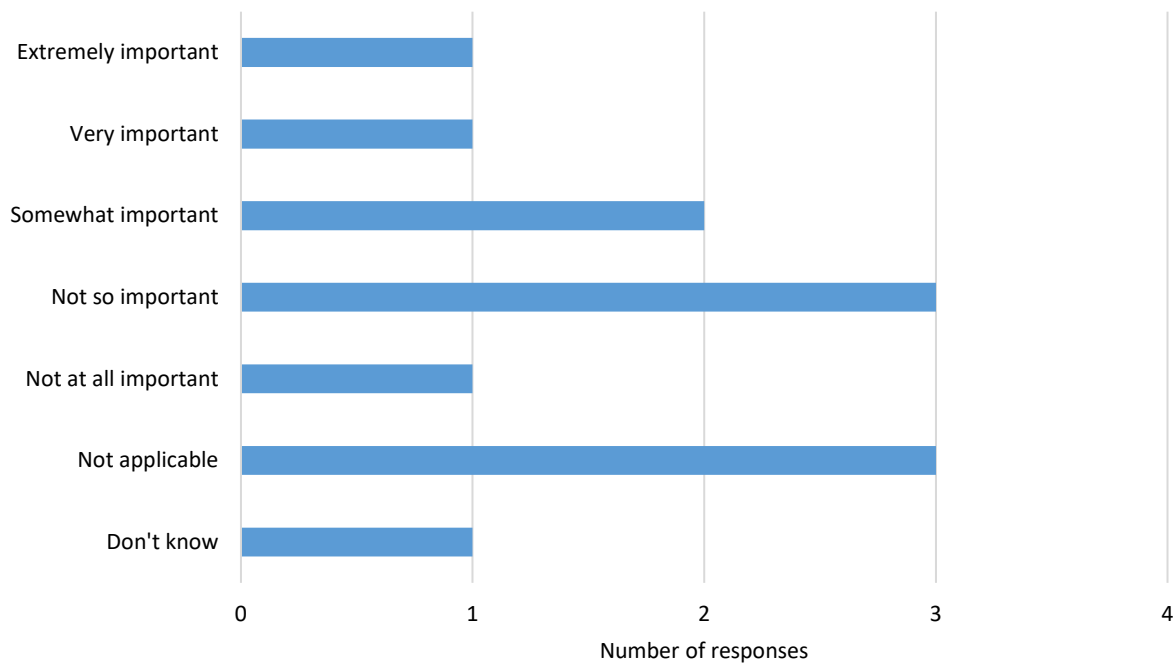

Figure Annex J: Compilation of the results from Q19 (If applicable) How important were the outcomes of your project for the business partners

Table Annex C: Compilation of the suggested improvements of the module (Q21)

- Incorporate it into the regular curriculum.
- Actual training in giving elevator pitch on business cases.
- Increased support from lecturers, greater collaboration with companies throughout the study program.
- While students from other schools had this challenge as a compulsory module, ASIS had it as a "fun thing to do on the side". Consequently, the commitment levels were not equal from all the participants. I would recommend the organisers look into creating an equal workload for everyone, not to have it to benefit only certain schools.
- All ideas should be developed if competent.
- Making it clearer what the company would like to see as a result of the project. Last year the topic was sustainability and radical innovation, however, the winning idea had nothing to do with neither sustainability nor radical innovation.
- Make it clearer what the company would like to see and how close the idea should be in line with the company's assets/business perspective. Last year the winners did not have a radical innovative idea compared to the existing business of Fujifilm. This was for me confusing since the whole point of the competition was to be radical and thinking out-of-the-box.