Challenge4Impact

Innovating together globally,

Playbooks of Student-Business Sustainability Challenges,

Insights, Reflections, and Roadmaps for Impact.

Frans Stel, Anne Seela and Karl Eldebo

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CORRESPONDING EDITOR

Vennebroek Academic Services
Vennebroek 12
9472RD Zuidlaren
The Netherlands

www.createnewbusiness.com

CONTACT

Dr. F.G. Stel
stel@createnewbusiness.com

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LIST OF ABBREVIATIONS

CBL	Challenge-based Learning
C4I	Challenge4Impact
FHC	Future of Healthcare Challenge (Title of the Challenge Program that was conducted in the Challenge4Impact project)
HEI	Higher Education Institutions
LiU	Linköping University
SBSC	Student-Business Sustainability Challenges
S4S	Scaleup4Sustainability (Project, funded by Erasmus+ 2018 – 2022)
UOL	University of Oldenburg
VAS	Vennebroek Academic Services

VUCA Volatile Uncertain Complex and Amgiguous

1 Introduction

1.1 AIM

The aim of this handbook or manual is to provide learning, teaching and training materials. It is a user manual or handbook for all who are interested in Challenge-based Learning as a training method to promote sustainable entrepreneurship. It offers guidance materials and "food for thought" for educators, support staff of Higher Educational Institutions, challenge providers: Companies, municipalities or other actors who wants to participate in this type of Sustainable Entrepreneurship Education.

In this handbook, we develop, describe and test concrete examples of Student-Business Sustainability Challenges (SBSC). We provide concrete guidance on specific formats of full-term SBSC-programs, and give special attention towards aspects of internationalization, digitalization, and sustainability. Contacts with business representatives are an integral part of the challenges. We developed, tested and evaluated new educational tools. The results of the educational formats have been and will be further evaluated in scientific papers. We include a discussion of the expected impact and transferability potential.

The educational aims of our SBSC- programs are (adapted from Bourn, 2018):

- addressing directly real-world issues of today;
- understanding of global sustainability themes;
- promoting creative, critical and reflective thinking in concrete ways;
- encourage 'active learning' of the participants, make and improve connections; between their own lives and the lives of others throughout the world;
- promoting the values base of social justice.

This handbook includes a needs analysis to stipulate the relevancy. It focuses on specific defined target groups and elements of innovation. It is developed as part of the Challenge4Impact (C4I)[1] project and focuses on the following concrete C4I-objectives:

1. Develop skills and competencies of students (curricular & extracurricular) and business partners in fighting climate change and other sustainability challenges by entrepreneurship;

[1] see our C4I website: https://www.challenge4impact.eu

2. Increase the quality of Challenge-based and digital teaching and learning formats;
3. Working in international teams (students, lecturers, businesses) to share knowledge, values, learning experiences and to prepare students for an international labor market and create the ability to work cross-cultural.

By addressing these objectives, we implement the concrete Project Result Four (PR4), as defined in the project proposal.

This handbook builds on other project results of the C4I-project. While PR1 gives more general guidance for student-business sustainability challenges. Apart from the results from PR1, we used the results of PR2 (Support Services) and PR3 (assessing outcome & impact) to develop specific SBSC formats: the Future of Healthcare Challenges. Furthermore, it uses some of the results of PR5 (special topic challenges): the cross-cultural competences game to prepare all participants for the full-term challenge[2]. In addition, this report builds on the results of our earlier project Scaleup4Sustainability (S4S)[3] : it zooms in on digital and international aspects of SBSC.

1.2 RELEVANCY

Developing global sustainable entrepreneurship is becoming more important due to the increasing global threats of climate change, pollution and resource depletion (Kim, & Coonan, 2023). So far, sustainability education has neglected to integrate entrepreneurial skills into other relevant competences such as exploring out-of-the-box ideas, wicked problem-solving, and interdisciplinary team collaboration (Hermann & Bossle, 2020)**.** Wicked problems are social system problems, which are ill-formulated, have confusing information, conflicting values, many stakeholders, shifting boundaries and resources for solving (Earle & Leyva-de la Hiz, 2020; Rittel & Webber, 1973). Therefore, our SBSC program aim to contribute to developing skills for sustainable entrepreneurship.

Our SBSC programs are a special form of Challenge-based learning (CBL), which is an advanced and innovative teaching methodology that stimulates students to participate in resolving real-world challenges while applying the knowledge they acquired during their professional training (Castro, & Zermeño, 2020*)*. CBL is a theoretically grounded educational concept (Leijon, Gudmundsson, Staaf & Christersson, 2021). CBL is becoming more popular at Higher Education Institutions (HEIs) because they are aware of the necessity to develop complex student skills to face todays social, environmental, and economic challenges (Gallagher & Savage,

[2] https://www.challenge4impact.eu

[3] https://www.scaleup4sustainability.eu

2020.; Van den Beemt, Vázquez-Villegas. et al. 2023).

One of the main characteristics of CBL is active learning or experiential learning, also known as inquiry learning, entrepreneurial learning or self-regulated learning or learning by doing. CBL combines experiential learning with a specific realistic assignment, application of rules, and aspects of collaboration within teams. Students discuss and define a societal 'wicked' problem, develop and test possible solutions and concretize the technical viability and economic feasibility of these solutions. In many cases the CBL-programs, include aspects of wicked problems in a 'VUCA' context: i.e. situations with high environmental dynamics and change (Volatility), combined with a high degree of uncertainty, a high number of interlinkages (Complexity), and multiple interpretations of current and future conditions (Ambiguity) (Schick, A., Hobson, & Ibisch, 2017).

As a teaching method, CBL is adjacent to problem-based learning or project-based learning, however, CBL differs in several ways (Gallagher & Savage, 2020). First, CBL involves less predefined problem content. Second, in CBL multiple stakeholders have a more active role as co-creators. Third, in CBL there is a focus on sustainability issues that demands a solution. Fourth, in CBL the learning process is part of the didactic approach: the outcomes (e.g. a business model) and the team processes are used to train students. Students reflect on the content and the learning experiences. Fifth, CBL focusses on developing 21st century skills or competencies, such as the ability to collaborate cross-culturally or cross-sectorally, to take initiative to solve problems creatively and to reflect upon the learning processes. These items have been identified as key to leading change (Gaebel, Zhang, et al., 2018)

Sustainable Student-Business Challenges (SBSC) can be supplementary to existing educational programs (extra-curricular) or part of educational programs (intra-curricular). CBL can be used in short term assignments (a single day or week) or full-term programs (during a semester or across an entire program with a duration of, for example an entire study semester. Assessment criteria of CBL are linked to overall learning aims of educational programs. In some cases, CBL takes place in a competitive climate, for example at hackathons, i.e. events where people in a 'pressure cooker' format engage in rapid collaborative engineering or innovation over a relatively short period of time. In other cases, CBL creates a co-creation climate using 'learning community' tools to enhance peer learning (Gallagher & Savage, 2020). A "Student-Business-Challenge" is a specific format of CBL in which a business partner provides a real-world innovation-related problem or challenge, which is then worked on by students who attempt to develop solutions to the challenge.

Sustainability problems (e.g. pandemics, climate change, pollutions, waste) extend beyond traditional national and sectoral boundaries. These problems are multi-faceted and international: in order to solve these problems, it is necessary to consider multiple disciplines and to take into account the viewpoints of multiple cultures or nationalities, - e.g. to develop new circular production, or to acquire knowledge from business partners with complementary competences. Successful transnational collaboration involves Attitudinal, Behavioural, and Cognitive (ABC) competences: the willingness or motivation to learn from others, the behavioural skills to recognize patterns from other industries or cultures, and to collaborate effectively with people of different backgrounds (Stel, & America, 2018). As sustainable problems extend beyond traditional national and sectoral boundaries, we focus on international and digital aspects in our SBSC

programs. To gain trans-sectoral experience, we involved students from multiple disciplines, ranging from business, technical to creative backgrounds. We gained additional international and digital experience by organizing SBSC- programs in global virtual teams.

1.3 TARGET GROUPS

In the C4I-project, we've identified four target groups: students, teaching personnel, companies, and transfer and innovation intermediaries. Advanced Bachelor (3rd or 4th year) and Master students participate in the SBSC programs, usually as part of their curriculum (e.g. international entrepreneurship). Teaching staff of participating HEIs are involved in the SBSC- programs as organizers. More than supplying new knowledge, the main role of teaching staff is to act as a coach, who facilitates the learning of the participants; the focus of a coach is more on supporting team processes than instructing.

Innovation and sustainability managers of companies are a target group as well in the SBSC-programs. They act as counterpart, challenge provider or client of the student teams. Throughout the program, managers can serve as the student teams' technology and marketing partners. They provide technical and practical advice to the student teams from their professional viewpoints about the healthcare markets and relevant technologies. They act as assessors, suppliers of experiences or discussant of the students. The added value for managers is to have a "window to the world", i.e. to obtain new fresh ideas from young international highly motivated students.

1.4 INNOVATIVE ASPECTS

The described SBSC-programs are aimed to be innovative because of their transnational and transdisciplinary character. All teams in our SBSC -programs were to a large extend virtual and consisted of members from different countries, disciplines, and universities. All teams were coached virtually by staff members; team progresses were measured via a virtual progress monitor (see 2.3.3). To increase the quality of the program, coaches were trained and evaluated. In a learning community, students and coaches exchanged eye openers, hurdles and lessons learned. All SBSC-activities are well as the training sessions (cross-cultural preparation of the teams and intervision for the coaches) were digital and interactive. In this report, we explore, test, and report the efficacy of the tools used. In addition, we will evaluate all experiences: of participating students, companies and staff-members.

In the SBSC programs, we simulated realistic problem-solving of "wicked" problems. Using creative techniques, the participants of the SBSC learned to define and delineate (abstract) societal problems. Involving different viewpoints, they explored new ideas and developed potential solutions. They concretized these while integrating multiple aspects. In the successive "Customer Development" phase, they tested concrete solutions at real stakeholders (e.g. customers). Participants learned to collaborate in heterogeneous international and virtual teams. They obtained the necessary knowledge and skills training ("learning by doing"). In addition, team coaches have created awareness of processes at the teams and stimulated reflexivity of the

participants.

1.5 IMPACT AND DISSEMINATION

As a result of our SBSC-programs, participating students have developed their mindsets and skills as preparation for sustainable entrepreneurship. Teaching staff in HEIs have gained experience with organizing, guiding, and evaluating virtual Student Business Sustainable Challenge programs in sustainable entrepreneurship, and having used new toolkits to implement these programs effectively. Managers and entrepreneurs have strengthened their capacity to execute innovative and sustainable practices. The impact on the targeted groups is raised awareness, improved understanding and experience of trans-sectoral and international implementation of sustainable business.

The participants made use of tools, which are all online available and usually have easily accessible templates. Because of this standardization, the programs have transferability potential and scalability.

1.6 IMPLEMENTATION ISSUES & EXECUTED FORMATS

The implementation of PR 4 is associated with some significant difficulties: first, a difficult obstacle in organizing virtual international challenges is the different semester dates in different European countries. The sequence of courses in German universities differs for instance significantly from the time schedules in other countries. Therefore, it is almost impossible to integrate curricular courses into a long-term virtual challenge format with universities of other countries. We have overcome this difficulty by developing a new format "Student Forum for Sustainable Entrepreneurship" to link modules from different universities with one another while these modules are at different stages of their schedule. We have implemented this format twice by organizing exchange sessions in which students from different universities commented on each other's projects. We describe these formats and playbooks in Chapter 3.

Table 1: Implemented full-term challenges

			Relevant dimensions		
J&J'S FUTURE OF HEALTHCARE CHALLENGE					
	Number of universities	Number of participants	Number of coaches	International (Number of nationalities)	Fully executed
Future of Healthcare Challenge 2023	4	33	7	6	no

Future of Healthcare Challenge 2024	6	30	10	7	yes
STUDENT FORUM FOR SUSTAINABLE ENTREPRENEURSHIP					
	Number of universities	Number of participants	Number of coaches	International (Number of nationalities)	Fully executed
How to work with a real company/ partner successfully	2	15		2	yes
Impact Forecasting of Student Business Challenges – Can your project make a difference	2	37		2	yes

The theme of the 2023 edition of the Future of Healthcare Challenge was to improve Environmental Sustainability in Clinical Research, i.e. to reduce the carbon footprint of clinical trials for the department of Innovative Medicines of Johnson & Johnson Pharmaceuticals. The Challenge provider was Johnson & Johnson Innovative Medicine department in Delft, The Netherlands. In the 2023 edition, 33 students of four universities participated. In total seven coaches guided the teams. The students had the American, German, Hungarian, Indonesian, Israeli, Italian, Japanese, or Nigerian nationality. They had a diverse technical or business background[4] and varied from first- or second-year Bachelor degree (B) to last year Master degree (M) students. Two major difficulties hampered the realization of the Future of Healthcare Challenge in 2023:

First, it was not possible to solve issues regarding confidentiality and Intellectual Property (IP) Rights with the legal department of the strategic partner of Johnson & Johnson (LabCorp) before the start of the challenge; LabCorp's legal team could not decide in time (i.e. before the challenge) about how to manage risks associated with IP ownership developed in the FHC. As an important strategic partner of J&J, LabCorp had a vested interest in the project of J&J to reduce the carbon footprint of clinical trials. Therefore, J&J wanted to have the full acceptance with all IP-related matters.

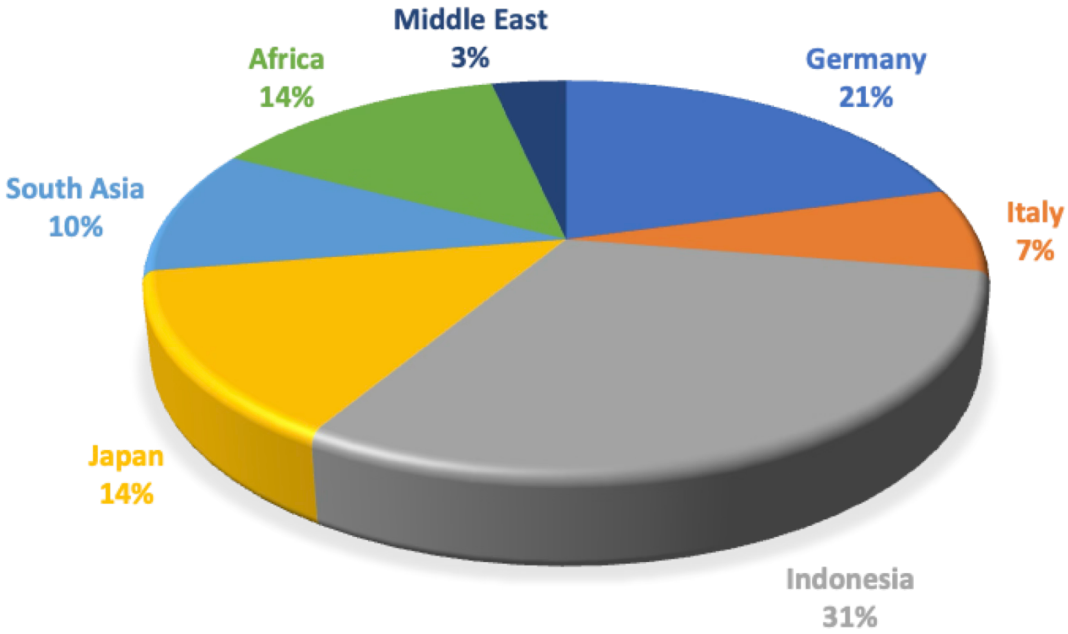
[4] Biology (M), Communication Science (B), Design (B), Digital Content Broadcasting (B), Digital Medical Technologies (B), Digital Public Relations (B), Economics and Management (M), Electrical Engineering (M), Engineering Physics (Renewable Energy, M), Industrial Engineering (B), Molecular biology & Biochemistry (M), Neurocognitive Psychology (M), Pharmacy (M), Sustainable Management (M).

Second, the situation was further complicated by the Hamas attack on Israel on 7 October 2023. As HIT Holon Institute of Technology (Israel) was also one of the participating universities, most of the students were committed to the war effort as reservist at the start of the challenge. Their active presence during the challenge activities was unlikely or at least uncertain. Despite extensive discussions with all partners, the teachers and students at Telkom University in Bandung (Indonesia), all with a Muslim background, refused to collaborate categorically to collaborate in teams together with any Israeli and therefore withdrew from the challenge. The Israeli and Indonesian contingent comprised of 55% of the participants. Both reasons, IPR-uncertainty and cultural conflicts, were prohibitive to continue the Future of Healthcare Challenge 2023.

The theme of the 2024 edition of the Future of Healthcare Challenge was to develop radical new and feasible circular business models for the pharma or healthcare industry. The Challenge provider was Johnson & Johnson Global Sustainable Solutions department in Schaffhausen, Switzerland. In the 2024 edition of the Future of Healthcare Challenge, 30 students of seven universities participated. In total 10 coaches guided the teams. The student had a Bangladeshi, German, Indian, Indonesian, Iranian, Italian, Japanese, Nigerian, Pakistani, or South African nationality. They also had a diverse technical (engineering etc.) or business background, although less diverse than the previous edition, ranging from communication science, game design, management & economics, sustainable management to pharmaceuticals.

In the 2024 edition of the Future of Healthcare Challenge (FHC2024), 29 students from Bangladesh, Germany, India, Indonesia, Iran, Italy, Japan, Nigeria, Pakistan, and S-Africa participated, see Figure 1. Due to sad family reasons, one participant did not complete the challenge. This drop-out ratio was considerably lower than in previous years.

Figure 1: Participants of the Future of Healthcare Challenge 2024 by nationality



The average age of the participants was 25.0 years (ranging from 19 to 40 years). In the FHC2024, 69% female and 31% male participated.

2 Future of Healthcare Challenge

2.1 INTRODUCTION

2.1.1 Factsheet

We used the following factsheet to introduce The Future of Healthcare Challenge (FHC):

Table 2: Factsheet of the Future of Healthcare Challenges

Positioning:	Part of intra-curricular activities for students in 3rd or 4th year Bachelor and Master programs
Academic Year:	2023/2024; 2024/2025
Key Learning Areas:	1. Critical (analytical) thinking 2. Creative thinking - curiosity 3. Resilience, flexibility and agility 4. Cross-cultural & multi-disciplinary collaboration 5. Digital literacy - use of Artificial Intelligence (LLM) 6. Green skills: circular business model innovation 7. Developing & testing business models (design theory) 8. Business partnering 9. Global citizenship
Theme context:	Circular Business Models for healthcare or pharmaceutical products
Period:	10-week program
Participants are expected to:	1. active participate in the plenary sessions and the team meetings. 2. prepare an infographic of the value proposition of their main idea. 3. develop an initial business model of their main idea. 4. test and pivot this idea at real customers, resulting in a validated business model. 5. produce a sales pitch video of their validated business model. 6. prepare and present their validated business model to an expert jury. 7. reflect weekly on their progress and team process using a progress monitor.

	8. assess the innovativeness and feasibility of all ideas. 9. participate in research about drivers of new venture creation.
Aims, success factors, phases, support, coaching & mentoring, deliverables & assessment	Video tutorial
Study load (EC):	5 ECTS = 140 hours. Depending on their curriculum, some of the participating universities request additional activities, e.g. – reflection reports of students or a business plan to ingrate more details. In these cases, additional credits are granted.
Learning areas	*Critical thinking:* Use the process of thoughtful evaluation to deliberately formulate a reasonable conclusion. *Innovation & creativity:* Create innovative ideas in a changing business environment in a systematic fashion. *Collaboration:* Collaborate effectively with different student and business stakeholders from possibly different (cultural) backgrounds and/or areas of expertise to contribute to achieving in the team agreed goals. *Marketing and sales:* Develop a well-founded business model scheme to support the creation of value for international customers. *International finance:* Evaluate financial performance of the organization from different stakeholders' perspectives in a dynamic international environment *Business research:* Analyse a complex business problem in a business setting with use of adequate research design, resulting in an evidence based, feasible solution.
Competence level	The competence level for this challenge is 3[5]: "The student is able to perform a complex task independently in a complex and unpredictable situation with complete control of the required skills." *Appendix 2* provides a description of generic competence levels in higher education.

[5] Competence Framework of Vereniging Hogescholen Nederlands, https://www.challengebasedlearning.org/framework/#:~:text=The%20Challenge%20Learning%20Framework%20includes,return%20to%20an%20earlier%20phase.

2.1.2 Key parameters

1. The theme of the full-term Challenge is: "The future of healthcare, circular business models for healthcare and pharmaceutical products".

2. The course is based on experiential learning and co-creation with companies. Students are expected to acquire knowledge through learning-by-doing by executing a complete innovation process from the "fuzzy front end" of ideation to meeting real customers in a customer development process. The course is designed as a mix of different types of learning activities: (1) three plenary sessions in which useful tools and techniques are explained and practiced; (2) team activities, in which teams take the initiative to develop their solutions to sustainable problems in team meetings; (3) weekly coaching sessions, in which teams reflect upon their progress and team process. The program requires a high level of student-driven entrepreneurial initiative. University staff members mainly act as coaches aimed at increasing the problem-solving capacity of the student teams.

3. Student teams identify a specific problem within this theme that is relevant to them and develop an innovative business model for a sustainable product / service in collaboration with relevant business partner(s) in the industry.

4. The participating universities incorporate the challenge in existing courses.
5. The challenge is international and organized in multi-university teams, with students from different European and Asian countries working together in virtual teams.
6. Each team consists ideally of four students.

7. Character of the challenge: high level of interactivity between participating students and teams. The first period (4-5 weeks) focuses on ideation, the second period on customer validation & business feasibility.

8. Preparation: background information is available in video - and text format prepared by the challenge-provider (Johnson & Johnson Sustainable Solutions, a unit of J&J Inc.).

9. The challenge is a ten-week program of six phases: (1) Orientation, (2) Problem; (3) Solution; (4) Validation; (5) Feasibility, and (6) Pitch. Every phase has its tools and deliverables.

10. Recruiting and configuring the student teams consist of the following steps: (1) The organizers of the challenge prepare a draft recruitment folder and other materials; (2) Using these resources, the participating universities recruit students. If possible, motivation letters and interviews are used to select students; (3) the organizer configures teams based on diversity in background and nationality.

11. Recruitment criteria for the full-term challenge are: motivation, fluency in English, ability to

cope with VUCA[6] circumstances, and interest in entrepreneurship, innovation & sustainability.

12. Preparation of the challenge before the kick-off: (1) a training workshop at the university aimed to create self-awareness, increase cross-cultural competences and project management skills; (2) online material ("pre-reads"), eventually with small preparatory assignments.
13. All participants of the FHC get access to a SharePoint folder, in which all hand-outs, tools, documents and deliverables are placed.
14. All participants get access to a collaborative online Moral white board environment to facilitate their joint ideation, for example "Solution Explorer"[7]
15. Participants are requested to give their consent for publication of their photos and videos.
16. The C4I-project organizes and facilitates three 2-hour exchange meetings for all participants to create a "learning community" with an open climate in which the participating student teams can exchange views leading to cross-pollination and new innovative insights. These plenary meetings are vital to the program and therefore mandatory. The meetings are a kick-off meeting at the start, a midterm meeting halfway and a final meeting to wrap up the program and the end.
17. The program of the ***kick-off meeting*** involves introduction of the program and the teams, the technology providing companies, the participating teams and their coaches. Program of kick-off consists of interactive Q&A break-out sessions with business experts and subject matter specialists.
18. The program of the ***mid-term session*** consists of (a) presentations of the initial value propositions of the participating teams visualized in infographics; (b) discussion about achievements and challenges; (c) preparation for upcoming phases.
19. The program of the ***end session*** consists of:
    a. team presentations: team video, business model video, pitch, Q&A with the jury;
    b. participant's assessment of all business idea of their colleagues beyond competition, for scientific purpose only;
    c. jury assessments of the business ideas and their business models, and awarding the winning team
20. Ultimately two days before the plenary sessions, teams upload their deliverables to the organizers via file transfer using the given templates Participating teams produce:

[6] **VUCA** = a Volatile Uncertain Complex and Ambiguous context.

[7] https://www.solution-explorer.de

a. two video pitches: introduction of team (1 min.) and a business commercial (3 min.);

b. two business model schemes; (1) business idea – qualitative (2) validated and quantified business model;

c. an infographic of the Value Proposition;

d. one sales pitch to the jury (max 5 min.) followed by Questions & Answers with a jury (max 5 min.).

21. The C4I-project provides content workshops for the key-learning areas ("cafeteria-model"). These workshops are optional – each university decides:

    1. working with Solution Explorer (online) or equivalent online ideation platform

    2. creative problem solving (offline),

    3. customer validation (online),

    4. negotiation game (online/offline), see playbook of PR5

    5. Ecotonos - cross-cultural collaboration - game (offline), see playbook of PR5

22. Student teams are expected to take the initiative to connect with the challenge-provider for Q&A exchanges.

23. The full-term challenge is preferably incorporated as a part of intra-curricular course for students in Bachelor or Master programs. Each university decides to make this challenge part of a specific intra- or extra-curricular program and if / to what extent students get ECTS-credits for participating.

2.1.3 Challenge-Providers

In the C4I-project, we developed the "Future of Healthcare Challenge (FHC)". In this challenge, the challenge provider was Johnson & Johnson Sustainable Solutions (2024 version) or J&J' Innovative Medicine (2023 version). Johnson & Johnson is one of the world's largest healthcare products companies. To improve their competitive Environmental – Social - Governance (ESG) standing, J&J intends to undertake measures to address environmental concerns, rectify social issues, and enhance governance practices because J&J's environmental footprint has been a major source of criticism. The company has been accused of using hazardous chemicals in its products, contributing significantly to greenhouse gas emissions. Beyond this, the company has faced criticism for engaging in unsustainable waste disposal practices, adding to the environmental concerns surrounding its business practices. The cumulative effect of these issues has intensified

the public discourse around J&J's environmental responsibilities and the need for the company to address and rectify its environmental impact. In 2020, the company announced a new ESG strategy, outlining goals for reducing greenhouse gas emissions, increasing renewable energy usage, and enhancing labour practices.

Johnson & Johnson Sustainable Solutions is a corporate department aimed to implement new sustainability initiatives. The department is very interested in the topic of **Circular Business Models in Healthcare** and more precisely in circular business models for the Pharma and MedTech industry.

In the challenge, students develop and test circular business models for and with Johnson & Johnson (J&J) Sustainable Solutions within a global team. Participants are looking for radical new business ideas (not incrementally new) which still are feasible. To be successful they take initiatives, work together in teams, don't stop when it's difficult, and use AI if/when appropriate.

In the *Orientation phase*, the Future of Healthcare Challenge-program and the company was introduced. To make the team members aware of the potential issues they could phase in the project, the teams conducted exercises about sustainability, team dynamics and intercultural collaboration. As first creativity exercise, the team members invented an original team name and presented themselves to the other participants in a short video pitch. In the second *"problem "phase*, they explored and expanded their playing field of problems, divergent creativity or 'idea idealism'. The teams generated as many as possible radical new unusual ideas. They were trained in shifting and switching perspectives, using analogies and brainstorming techniques; making mind maps and trend analyses. In the third *"solution" phase*, the focus was on convergent creativity or 'idea realism'. The teams combined, integrated, and selected possible solutions. They used several techniques, in which potential positive and negative aspects systematically were analyzed. The output of this phase was an initial (that is untested) business model; teams identified, explored and defined a real sustainability problem into a business model-in-four as suggested by Amit & Zott, C., 2021, and Gassman, Frankenberger, Ket al., 2020, that consists of a:

1. Value proposition: which solution which problem;
2. Customer specification: to which customer segments to sell, which type of customer relations to aim for;
3. Implementation: which type of activities, resources and partners;
4. Monetary aspects: which categories of cost and revenue.

The initial value proposition was presented in a short service/product pitch (1') and a submitted template of an initial Business Model. In the fourth "*validation" phase*, the focus was on customer realism. In this phase, the teams tested and pivoted their assumptions by asking customer feedback. They collected data using surveys and interviews and produced a minimum viable prototype. In the fifth "*feasibility" phase*, the teams increased the business realism of their ideas: they conducted quantitative and financial analyses about cost & benefit, business ecosystems, industry and competition, and scalable impact of their ideas. In the last "*pitch "phase*, the teams

focused on pitching & interacting with the auditors. They presented their cases as convincing as possible in a (3') video and prepared their pitch that included Q&A with an expert jury who decided which team should win the Fujifilm Future Award. Apart from this award, all teams rated the novelty, feasibility and sustainability of their peers. These data are used for research purposes.

Besides the team meetings and the weekly coaching, the FFC consisted of three plenary meetings: a kick-off at the start of phase 2, a midterm session after the two creativity phases 3 & 4 and final pitch at the end of the program. To monitor the progress of the teams, all team members and their coaches completed a concise internet questionnaire. This tool gave quantitatively and qualitatively insight to the coaches and the program management about the progress, hurdles and achievements. The coaches met with each other regularly to co-ordinate their advises and learn from each other.

2.1.4 Coaching of teams

All teams are supported by a team coach from a participating university: weekly, coaches met with their teams virtually. After each coaching session, students and coaches reported the outcome of the coaching via the "progress monitor" (see Appendix 6). Coaches met to exchange experiences based on the progress monitor twice: 1x in the ideation phase and 1x in the validation/feasibility phase.

Apart from these intervision sessions, all coaches had frequent contact with the challenge organizer via Zoom or WhatsApp to solve any issues within the teams (e.g. regarding individual engagement, team dynamics and cultural communication issues).

As mentioned before, the main role of teaching staff was to act as coach, who facilitates the learning of the participants: coaches support students rather than instruct.

For teaching staff, it is important to understand the clear distinction between roles: to refrain from inclination to act as project or team leader and instead focus on stimulating the team processes aimed at increasing the problem-solving capacity of the teams by asking rather than instructing: e.g. *"what can you do in the team to solve a specific communication issue? How would you like to solve it? Why? Why not …? What would/could be your role as team member to solve?"*.

A coaching training is important to prepare teaching staff to become effective team coaches. In such a training, experimenting and mastering basis coaching skills is exercised; basis skills are, e.g. - listening without prejudice, un-biases questioning, summarizing and reflecting, unlocking limiting beliefs, being non-judgmental and open-minded, giving constructive feedback and resisting temptation to talk. Especially practicing with how to handle with critical incidents can make improve the efficacy of team coaches.

2.1.5 Intellectual property rights IP

In our SBCS-programs, we agreed with the business partners upon the following clauses:

1. Unless otherwise agreed upon and until it has been agreed upon in writing and signed by the duly authorized representatives of parties involved, the participating companies will not claim ownership rights regarding the ideas and concepts generated within the scope of the Challenge.
2. In case participants are expecting to develop a patent worthy invention, the teams are encouraged to register their ideas at an independent patent expert or the Transfer of Technology Office of one of the participating Universities before sharing the idea outside the team, which can nullify the condition of novelty.

This indicates that the initiative of protecting their ideas lays with the teams. Usually, the ideas generated have a "pre-competitive" character, i.e. it is in an early stage of development and does not contain in-depth company confidential information.

2.2 PLAYBOOK FHC

2.2.1 Activity overview

The FHC-challenges consisted of the following activities:

Table 3: Components of the Future of Healthcare Challenge

Activities	Dates & Time	Themes
Orientation phase		
1. Preparation (per university)	September/Mid October 2024	1. What to expect from the challenge and the participants? 2. Cross -cultural collaboration 3. Working in virtual teams 4. Working with the available challenge tools ("Solution Explorer") 5. Preferences Questionnaire[8]

[8] Survey of entrepreneurial, cultural and creative abilities used for scientific purpose.

Ideation phase: Problem & Solution		
Activities	**Dates & Time**	**Themes**
2. Kick-off meeting (plenary)	17 October 2024 10:00-12:00 (CEST)	1. Energizing the community 2. Teams presentations (1' videos) 3. Q&A with challenge providers 4. Preparation of phase 2 and 3
Meeting with team coach (4x)	Weekly	1. Progress and team dynamics 2. Progress monitor
Q&A with challenge-provider : tech. experts of J&J (max. 4x)	Weekly	Reducing knowledge gaps concerning technology and markets
Team work	Team specific	Ideation: diverge & converge
Validation & Feasibility phase		
Midterm meeting	21 November 2024 10:00-12:00 (CEST)	1. infographics of the initial business models 2. hurdles and achievements 3. preparation for the validation & feasibility phases
meeting with team coach (4x)	Weekly	1. Progress and team dynamics 2. Progress monitor
Q&A with challenge-provider: tech. experts of J&J (max. 4x)	Weekly	Reducing knowledge gaps concerning technology and markets
Team work:	Team specific	Validation, feasibility and pitch
Pitch phase		
End- / award meeting - pitch	19 December 2024 10:00-12:00 (CEST)	1. Videos - Pitches & Q&A 2. Voting business idea of colleagues beyond competition, for scientific purpose only. 3. Surprise event during the jury consideration 4. Jury assessments of the teams, and awarding the winning team with an award
Finalization		
Follow up (organizer)	December	1. Certificates of participation 2. Organizing the incentive award 3. Public relations 4. Evaluation

2.2.2 Detailed Playbook FHC

Time	Activities	Responsibilities	Materials
Preparation			
Start 3 Months prior to the Challenge	Decision on dates Decision on play book and documents Decision on programme details	All stakeholders	Promo material Teaser and factsheet
Start 1 Month prior to the Challenge	Publish promotion leaflet: communication to participants Selection of participants Recruitment of coaches Participants per university are known Send list of participants to organizer	All participating universities	List of participants and coaches
2 weeks prior to the Challenge	Train coaches Form student teams, assign coaches, Send invite and preparation instructions to students Example of trailer: https://youtu.be/ZwQneNzEF9c	Organizer	Teams + Coaches lists Training material coaches, Introductory material for students on challenge and tools
1 day prior to the Challenge	Collect team-deliverables (one-minute team presentation video-clip) Finalize program kick-off session	Organizer	Slides
Entire program (10 weeks)			
1 hr/week	Team meetings with coaches (10 x)	coach	Via Video conference
1-2 hr/week	Team meetings of students – own initiative	teams	Via Video conference or text messages[9]

[9] Teams organize themselves differently. Synchronous or asynchronous chats are also possible.

Orientation phase (1 week before Kick-off)			
Time	Activities	Responsibilities	Materials
1 hr/week	Team building exercise concerning intercultural collaboration, team dynamics and clarification of the programme.	coach	Slides and video: Team building: https://youtu.be/qU_fpiQo_c0 Clarification: https://youtu.be/LylyhZaw1IY
Kick-off session (2hr)			
30'	Introduction of program; who is who Presentation of team videos Presentation of the challenge-provider Examples of team presentations can be found via: **2024:** Greenovators ; CareXplore ; United Nations of Awasome ; Loopotrons ; Restiv ; Zoom Bamboons **Earlier examples:** Mixed Brains ; The Catchers	Organizer	Slides and videos Problem phase: Solution phase: Explanation Enabling technologies: https://youtu.be/8hDpVYqJ5HE
30'	First brainstorms in break-out rooms with assistance of technical experts from the challenge-provider	All	In breakouts sessions
30'	Explanation of assignment for the (+/- 4) weeks to come and deliverables (preliminary value proposition and un-validated business model)	Organizer	Slides

Mid-term exchange session (2 hr)			
Time	Activities	Responsibilities	Materials
Days Prior	Collect team-deliverables (preliminary value proposition and un-validated business model) Finalize program mid-term session	Organizer	Slides and video: Validation phase
60′	Presentation of infographics of teams Introduction of customer validation tools Explanation collaboration and validation exercises	Organizer	Slides
30′	Q&A of technology provider J&J Sustainable Solutions – carrousel of break-outs	All	In breakouts sessions
30′	Explanation of assignment for the (+/- 4) weeks to come and deliverables (final value proposition and validated business model)	Organizer	Slides
Pitching Session (2 hr)			
1 Month Prior	Recruitment of jury members	Organizer	Jury members list
2 Days Prior	Collect team-deliverables (final value proposition and validated business model) Finalize program end-game session Distribute relevant materials to jury-members for preparation	Organizer	Slides
10′	Explain proceedings of the day	Organizer	Slides
60′ - 80′	Student teams pitch, Q&A by jury-members Example of sales pitch:	All	Plenary
30′	Jury conveys and decides on winner Award ceremony	Organizer	Slides

Evaluation phase			
Time	Activities	Responsibilities	Materials
Shortly after the Pitching session	Send out evaluation to students, coaches, challenge provider	Organizer	Surveys
1 Month after the Pitching session	Prepare evaluation reports Evaluate with coaches Evaluate with challenge provider and decide on future improvements and enhancements Send certificates of participation Organize incentive prize	Organizer	Surveys Evaluation reports Decision on future improvements and enhancements

2.3 SUPPORTING MATERIAL

2.3.1 Video tutorials FHC2024

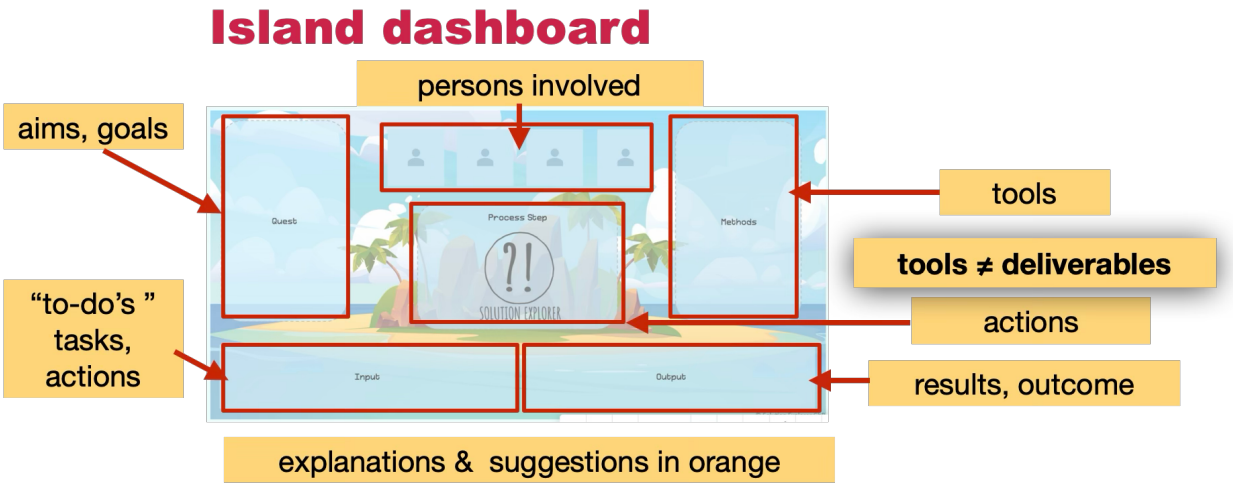
TOPIC	LINK
Johnson & Johnson	• Societal impact • Products & solutions • Approach to climate action
Circular Economy	Explanation
FUTURE OF HEALTHCARE CHALLENGE	
Intro of program	Program pitch Fujifilm Challenges
Phase 1: Orientation	Future of Healthcare 2024: what to expect?
Phase 1: Orientation	How to become successful in an intercultural virtual team
Brainstorm tool	Solution Explorer: digital brainstorm & collaboration tool
Phase 2: PROBLEM	Aims, deliverables and creativity (I) tools
Phase 3: SOLUTION	Aims, deliverables & creativity (II) tools
Phase 4: VALIDATION,	Aims, deliverables & customer development tools
Phase 5: FEASIBILITY	Aims, deliverables & feasibility tools
Phase 6: PITCH	Aims, deliverables & pitching tools
EXAMPLES	
team presentation videos	Team Mixed brains (2019) Team "The Catchers" (2019) Team Imagination (2018) Team Melting pot (2022)
End product pitches	"Edible packaging" Micro plastics blood filtering "Reduce emissions while generating energy" "Medical contact lenses"
TOOLS (general):	Examples – templates ("Scale-up for Sustainability" toolkit)

2.3.2 Selected tools per phase FHC2024

In the Future of Healthcare Challenge, we used the Solution Explorer (SE)**,** a digital brainstorm and project management tool based on Muralboard (www.mural.co). With the Solution Explorer platform, the participants discussed digitally with each other. SE integrates methodologies as Design Thinking, and Lean Startup, aiming to simplify, and promote interactivity of innovation processes.

The Solution Explorer for the FHC2024 consisted of 6 "islands"; for every phase an island (see **Figure 2**. Per island, short descriptions of aims, to-do actions, responsible persons for specific actions, and a specification of desired outcome. Each team received a unique and confidential link, only accessible for the team members, their team coaches, and the organizers of the challenge. On SE, links to many tools were given. Most tools were accompanied with a template and a video tutorial. The participants could find these tutorials by clicking on the tool cards and the templates of SE.

Figure 2: Island of Solution Explorer



More info at this SHAREPOINT (SP#):

Levels: 1= easy … 5= complex

1. ORIENTATION PHASE: team building & preparation

Tool nr.	Level	TOPIC	What is it? Why relevant?	Links	SP#
1.1	1	Introduction	What to expect from the challenge? Aims, success factors, phases, support, coaching & mentoring, deliverables & assessment	Explanation	
1.2	3	Intercultural communication dynamics & reflexivity in virtual teams	Compare your own cultural norms with your team members	How to become successful in an intercultural virtual team Culture map (Erin Meyer)	New
1.3	1	Personality analysis	a personality test to determine complementary characteristics for an ideal team.	Explanation	70

PHASE: 2. PROBLEM

More info at this SHAREPOINT (SP#):

Levels: 1= easy … 5= complex

Tool nr.	Level	Topic	What is it? Why relevant?	LINKS	SP#
2.1	1	Creativity tools Future Healthcare challenge (1)	General introduction of creativity tools: • divergent thinking • Analogies • switching perspectives: 9 windows: Zoom in/out	Tutorial	

2.2	1	Brainstorming	Generate as many ideas on a topic as possible within a very short time, either alone or in a group.	Explanation Template	14
2.3	1	Quick Sketching	Sketch as many ideas as possible on a specific topic within a limited time.	Explanation	79
2.4	2	Five Why	Question the actual cause using an iterative questioning technique and find the original problem.	Explanation Template	3
2.5	1	How might we?	Ask yourself several times the question "How could you...?" to discover alternative solutions.	Explanation Template	31
2.6	1	Mind mapping		Explanation Template	
2.7	4-5	Analogies	Search for similar processes in nature or in your environment to come up with new ideas.	Explanation Tutorial Explanation at 4:06 TRIZ method (Oxford Creativity) TRIZ method (ETH Zurich)	5
2.8	4	Zoom in & out, Before-now-later Nine-Windows-Matrix	Examine your system from different angles and find new approaches (out of the box). Describe the idea in a 3x3 matrix: • 3 levels (system, sub-system, and super-system) • 3 points in time (before, now, and after)	Explanation at 8:06 Template: See Solution Explorer	
2.9	3	Trend Analysis	Analyze the market for megatrends and/or specific market trends. Choose the most relevant for your challenge and determine the influence on your project.	Explanation (EY) Explanation (University Sydney) Template	32

PHASE 3: SOLUTION

More info at this SHAREPOINT (SP#):

Levels: 1= easy … 5= complex

Tool nr.	Level	Topic	What is it? Why relevant?	LINKS	SP#
3.1	1	Solution phase	Creativity tools (II): • convergent thinking; • 5W2H • pros & cons: PMO • Value Equation: include positive and negative aspects of your ideas including interfaces	Explanation	
3.2	3	Value Proposition Canvas	What is the problem ("pain") of customers you intend to solve ("gain"): describe the added value of your solution.	Explanation Explanation 2 Template	113
3.3	4	Business Model Canvas (BMC)	Use the BMC Templates to create a structured overview of the main elements of your business model. See the 55-generic models at Solution Explorer: adapt some of these 55 to your own business model through creative imitation and recombination.	What is a Business Model? Business Model Canvas in 4 (Gassman) Alternative: (BMC in 9 segments, Osterwalders– Strategyer)	12 96
3.4	3	Hypotheses Board	Make assumptions of potential customer needs and suggest potential solutions.	Explanation	33

PHASE 4: VALIDATION PHASE

More info at this SHAREPOINT (SP#):

Levels: 1= easy … 5= complex

Tool nr.	Level	Topic	What is it? Why relevant?	LINKS	SP#
4.1		Customer validation phase	Aims, deliverables and tools	Explanation	
4.2	1	Mom Test	Asking the right questions to potential customers. Listening to real customer signals instead of asking confirmation	Explanation Template	58
4.3		Assumptions	Testing your assumptions	Explanation (between 13:15-19:50)	
4.4	2	Mock-Up	Simulate the Look and Feel of your solution through a prototype.	Explanation Template	57
4.5	3	Questionnaire	Develop a questionnaire with target questions (open or closed) and conduct a meaningful survey.	Explanation Template	25
4.6	2	Interview	Conduct interviews with your target group to get a better understanding of them or your solution.	Template	38
4.7	3	Group discussion	Conduct a group discussion with customers and stakeholders to get their feedback on your product or service.	Explanation Template	28

PHASE 5: BUSINESS FEASIBILITY

More info at this SHAREPOINT (SP#):

Levels: 1= easy … 5= complex

Tool nr.	Level	Topic	What is it? Why relevant?	LINKS	SP#
5.1		Business feasibility	Phase 5: Aims, deliverables and tools	Explanation	
5.2	4	Business Case	Describe an quantify your business case	Explanation Template	15
5.3	3	Market attractivenes	Evaluate your solution based on its market attractiveness today and in the future (Product Market Matrix).	Explanation Template	55
5.4	2	Competition analysis	Describe and compare the largest competitors with their strengths and weaknesses.	Explanation Template	36
5.5	4	Revenue strategy	Identify the best pricing and yield mechanics option for your market or solution.	Explanation Template	24
5.6	3	Business Ecosystem Analysis	Include external parties in your analysis: a business ecosystem - actors and their relations to your business idea.	Explanation	16

PHASE 6: PITCHING

More info at this SHAREPOINT (SP#):

Levels: 1= easy … 5= complex

Tool nr.	Level	Topic	What is it? Why relevant?	LINKS	SP#
6.1		Pitching phase	Aims, deliverables and tools	Explanation	
6.2	3	Back to the essentials	Describe your project with the essential information for each addressee on one page.	Explanation Template	63
6.3	2	Pitching	Convince your target group with a short and emotional pitch of your project. Turn your story into a video, quickly, easily automated.	Explanation Template	71
6.4	2	Storytelling	Create verbal or visual reports about the experiences and oaths of your customers.	Explanation Template	98

2.3.3 Assessment scheme

		1 = NOT AT ALL	2-4 = BELOW AVERAGE	5 = MEDIUM	6-9 = SUBSTANTIAL	10 = VERY MUCH
NOVELTY of Value proposition (VP)	Idea is radical **new**	Not original	Hardly original	Somewhat original	Original	Highly original
	Real '**pain' and gain'**	Not clear or relevant	Hardly relevant	Somewhat relevant		Highly relevant
	Concrete **prototype**	Not present	Essential elements or prototype available	No functioning prototype	Clear prototype but not linked to the VP	Prototype demonstrates clearly the VP
FEASIBILITY	Real **customers** are interested	No proof of customer feedback	Some customers asked	Some customer feedback but relevance to VP is unclear	Customer feedback with limited relevance to VP	Customer feedback validates the VP
	Main **activities** and **resources** are described	Not described at all	Hardly described	Incomplete picture of activities and resources	Activities and resources are in essence known, but not quantified	Clearly quantified picture of activities and resources
	Cost & benefits are realistic	Not described at all	Hardly described	Incomplete picture of cost & revenue	Cost & revenue are in essence known, but not quantified	Clearly quantified picture of cost & revenue
SUSTAINABILITY	**Social** Improvement / impact	Not described at all	Hardly described	Some social advantages	Substantial social advantages	High social impact
	Environmental improvement / impact	Not described at all	Hardly described	Some environmental advantages	Substantial environmental advantages	High environmental impact
TECHNOLOGY	Technical **feasible**	Not technical feasible	Hardly technical feasible	Somewhat technical feasible	Technical feasible	Highly feasible
	Interesting for Fujifilm	Not interesting	Hardly interesting	Somewhat interesting	Interesting for Fujifilm	Highly interesting

2.3.4 Scoring Form FHC2024

Team nr	1	2	3	4	5	6	7	8	9	10
Team & project name										
Idea is radical new (max 10 pts)										
Real 'pain' and gain' (max 10 pts)										
Concrete prototype (max 10 pts)										
Real customers are interested (max 10 pts)										
Main activities and resources are described (max 10 pts)										
Cost & benefits are realistic (max 10 pts)										
Social Improvement /impact (max 10 pts)										
Environmental improvement / impact (max 10 pts)										
Technical feasible (max 10 pts)										
Interesting for Fujifilm (max 10 pts)										
Subtotal Points										
Correction factor (max 10 pts)										
TOTAL POINTS										
RANK (1=high; 12=low)										

2.3.5 Progress monitors

PROGRESS MONITOR Future of Healthcare Challenge (student version)

All information will be kept strictly confidential. We respect your privacy and take protection of your personal information seriously. The answers you provide will be shared only with the research team described below. We store data only as long as is necessary for the research. We will never pass your details to third parties for marketing purposes. We will never sell your personal information. On request, we will remove your information from our files.

Q1 **Please rate the progress of your team for the past week:**
Shift the sliders between left (0% - Strongly disagree) and right (100% - Strongly agree).

Q2 ***What was your team's most important learning during the past week?*** (in keywords only)

Q3 ***What was your team's biggest challenge during the past week?*** (in keywords only).

PROGRESS MONITOR COACH Future of Healthcare Challenge 2024

All information will be kept strictly confidential. We respect your privacy and take protection of your personal information seriously. The answers you provide will be shared only with the research team described below. We store data only as long as is necessary for the research. We will never pass your details to third parties for marketing purposes. We will never sell your personal information. On request, we will remove your information from our files.

Q1 **Please rate the progress of your team for the past week:**

Shift the sliders between left (0% - Strongly disagree) and right (100% - Strongly agree).

	0 10 20 30 40 50 60 70 80 90 100
Team shows COMMITMENT to achieving its goals	
Team works EFFICIENTLY (divides up the tasks, monitors progress)	
Team is QUALITY oriented (is willing to make changes to do better)	
Team is LEARNING from experiences (shows reflection)	
Team is CREATIVE (shows out of the box idea generation)	
Teams works according to AGREEMENTS (tasks and deadlines)	
Team has put ADVICE from the COACH into practice (openness to change)	
Team coaching INTERACTION is positive (communication and feedback)	
The team makes PROGRESS on achieving its end goal since the last coaching?	

Q2 **What was your main *advice to the* team for the forthcoming week?** (in *keywords only)*

2.3.6 Competence levels

	Competence level	Complexity		Autonomy
		Complexity of the task	**Complexity of the context**	
1	The student is able to perform a simple task with guidance in a limited context.	Simple and structured. Issue is familiar. Standard procedures. Basic knowledge and skills are required.	Defined. Familiar, predictable. Monodisciplinary. Few parties involved. Low level of interaction and communication.	With guidance: instructions, coaching and/or supervision. Acting in accordance with the instructions, not based on own initiative.
2	The student is able to perform a well-defined task independently in a relatively clearly arranged situation, or is able to perform in a complex and unpredictable situation under supervision.	Complex but structured. Issue is partly familiar, partly unknown. Standard procedures must be adjusted. Specialist knowledge and skills are required.	Unknown but transparent. Monodisciplinary. Several parties involved. Average level of interaction and communication.	With intermediate coaching, or coaching on demand. Acting on own initiative (as well). Making (some) choices and decisions. Responding to unexpected circumstances (within limits).
3	The student is able to perform a complex task independently in a complex and unpredictable situation with complete control of the required skills.	Complex and unstructured. Issue is unknown, must be analysed. No standard approach exists, new procedures may need to be developed. Advanced specialist (and sometimes interdisciplinary) knowledge and skills are required.	Unknown, dynamic and non-transparent. Multidisciplinary. Several parties and political sensitivities must be taken into account. High level of interaction and communication.	Little direction and coaching. Acting upon own initiative. Making well-argued choices and decisions. Responding to unexpected circumstances. Reflecting on own tasks and role.

Note. Retrieved from https://www.verenigingenhogescholen.nl/system/profiles/documents/000/000/224/original/international-business.framework.2018.pdf?1518520108

2.4 EVALUATION

2.4.1 Assessment

a. The assessment criteria are (a) novelty of value proposition; (b) feasibility (c) sustainability; (d) relevance to J&J. See Jury assessment scheme in Appendix 4).
b. Awarding the winning teams is delegated to a professional jury of three or five experts with a different background: innovation; entrepreneurship; sustainability; international business; and a representative of the challenge-provider.
c. Rubrics for assessment and juror scoring form, see Appendices 4 and 5.
d. In case not all required deliverables are submitted, per team 10 pts will be subtracted from the score.
e. The challenge is part of scientific research concerning innovation & entrepreneurship skills. Participants respond to a personality questionnaire before and a performance and impact assessment after the challenge;
f. The chairman of the jury is a representative of the challenge provider (J&J).
g. The incentive for the winning team is a set of rlevant books as well as a customized Circular Business Course organized by Johnson & Johnson as well as a selection of relevant books regarding circularity, sustainability and Business Model Innovation. The preliminary program of the workshop with experts from industry and academia is: (1) Importance of Sustainability in Today's World: Climate change, resource depletion, and social equity; (2) Key Principles of Circular Economy; (3) Case Studies of Circular Economy Successes and Examples from the healthcare industry; (4) Purpose driven and sustainable business models; (5) Interactive case study; (6) Wrap-Up: Review of Key Takeaways, Questions and Discussion; (7) How to get started in industry. A certificate of participation will be provided to each of the winning- team members.

2.4.2 Evaluation results

The overall satisfaction rate of the participants was 84%, which was 5% higher than the average score of comparable programs in the period 2016-2022, see Table 4. For all criteria, the satisfaction of the participants was high, see 4@ (all scores are percentages).

Table 4: Satisfaction by challenge aspect

	adequate responses of organizers	adequate responses of J&J	meetings with coaches useful	enough time	FHC well organized	overall rating FHC
FHC2024	86	88	83	76	86	84
avg 2016-22	77	82 (Fujifilm)	75	70	74	79

The satisfaction of the tools varied; the video tutorials concerning aims, deliverables, and tools per phase as well were used often (82.9%), whereas the digital tools were considered useful at a rate of 81.4%. In comparison, the ideation and project management tool "Solution Explorer" was used less frequently (65.0%) and was considered easy to use and useful a bit lower (72.9 and 72.4%, respectively), see Table 5. Solution Explorer was considered to be a little complex, while other possible easier software tools could be used in next editions, according to a female student from Germany. Female students from Indonesia, Japan and Italy suggested to provide fewer course materials.

Table 5: Satisfaction of tools

Used video tutorials (aims, deliverables, and tools per phase)	Digital tools were useful (YouTube and templates)	We used the Solution Explorer (SE) frequently	The SE was easy to use	SE was useful to organize our tasks
82.9%	81.4%	65.0%	72.9%	71.4%

Interest & complexity

We evaluated the extent to which several components of the FHC2024 were considered to be interesting and complex. The top 3 most interesting aspects were: identifying a sustainability aspect (85.2%), cooperating within my team (84.4%), and ideation and creativity (83.7%), while the top 3 most complex aspects were: cooperating within my team (63.7%), preparing our pitch (58.5%), and identifying a sustainability aspect & discussing with potential customers (both 57.0%), see Figure 3.

These ratings are higher than the perceived complexity. With the help of some creativity tools, weekly coaching sessions and technological support, students can find and test possible solutions to wicked sustainability problems. Afterward, due to their real experience with a high-tech company, students feel more confident in innovative entrepreneurship. As examples of learnings from the Future of Healthcare challenge could be mentioned that commitment and team processes are the strongest predictors of new venture performance.

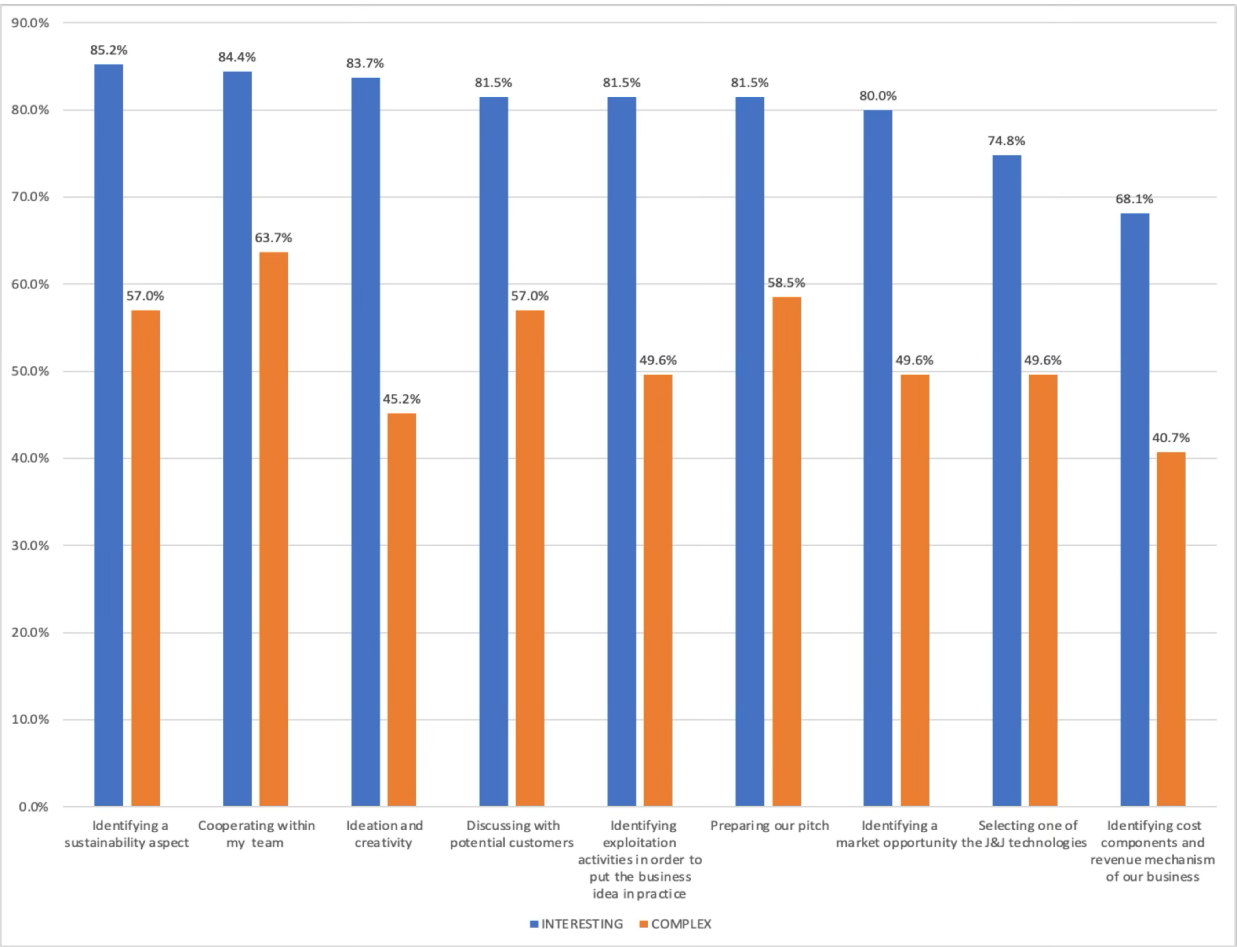
Weekly, the participants and their coaches reported the commitment and progress of the teams.

This progress monitor (Section 2.3.5) was a strong predictor of the performance of the teams: the more committed teams performed better. In addition, with the progress monitor we could predict problems within teams resulting in drop-out of some participants. We noticed lower commitment halfway the challenge (when the participants were struggling with the creative problem solving), followed by higher commitment and progress in the final phases (when they tested their initial solutions). The progress monitor served as well as agenda for the collegiate meetings of the coaches where they discuss the coaching processes and progress of all teams.

The **coaches** advised their teams to broaden the scope by diving into the related problems, empathizing with important users and stakeholders. In many cases, the teams

focused too much on the solution in the diverge stadium of creativity, phase 2 (problem). Some coaches advised the teams to develop more idea's while avoiding a premature selection of ideas. Explore some 'more funny' creative ideas. The coaches spent much attention on team processes: they urged them not to work individually, but work together, interact and communicate more! They advised them to give more room to the different people in the team, with different interests and expertise. Involve all team members! The coaches advised the teams to communicate more effectively (and frequently) with the staff from Johnson & Johnson.

Figure 3: Interest & complexity



We asked the participants whether they would recommend the challenge to others. In the FHC2024, 91.4% responded "yes" while 8.6% "no". In comparison with the previous editions, the non-recommendation rate was a bit higher: in the period 2016-2022, the average score was 5.4%. Three German participants would not recommend, stating" *"Other team members don't receive a grade for the project which creates different incentives; progress strongly depends on the team"* and *"Too much stress with communication and commitment in the group"* while *"it was too much workload"*.

Entrepreneurial intentions

Before and after the challenge we asked the participants: *Have you ever seriously considered becoming an entrepreneur?* In this year's edition, the score for Entrepreneurial intent increased from 79.3 to 82.1%, which is slightly higher compared to the period 2016-2022; in this period, the score for Entrepreneurial intent increased from 66.2% to 74.5%. Afterwards, the participants responded to "Participating in this contest has made it MORE likely that I will become an entrepreneur or start my own business". The same pattern can be observed: slightly higher entrepreneurial intent:

63: Entrepreneurial intentions

Table 6: Entrepreneurial intentions

Entrepreneurial intentions	FHC 2024 (n=29)	2016-2022 (n=161)
Have you ever seriously considered becoming an entrepreneur?	YES: 79.3 => 82.1%	YES: 66.2% => 74.5%
"Participating in this challenge has made it MORE likely that I will become an entrepreneur or start my own business"	73.6%	69.4%

Ref: Linan, Rodiguez-Cohard & Rueda-Cantuche, 2011; Linan & Chen, 2009.

2.4.3 Qualitative feedback

For this evaluation, we used evaluation essays as well as a questionnaire from all our participants in the FHC2024. The key themes from the participants' experiences, highlighted their take aways Waste, Sustainability, and Circular Business, Cross-Cultural and Cross-Disciplinary Teamwork and Personal Entrepreneurial Growth.

Participants gained insights on **waste issues** ("*Recycling unused medications could reduce waste, save resources, and promote responsibility among consumers.*"). Some take aways on awareness and addressing of **healthcare** were mentioned: *"This challenge opened my eyes to the big problem of unused and expired medications harming the environment and public health. It showed me how important it is to find ways to recycle these medications to reduce waste and save resources.*"The challenge revealed the importance of **global awareness of circular economy and sustainability**:" *I've gained a deeper understanding of the circular economy, its principles, and its potential to address environmental and social challenges.*") Regarding the most important personal

learnings in the challenge, participants emphasized the value of **cross-cultural and cross-disciplinary collaboration** in generating innovative solutions. Empathy and adaptability were considered crucial in cross-cultural teamwork: *"I learned to listen actively and appreciate diverse perspectives, which enriched our discussions."* Although it was not easy**:** "*How difficult it is to communicate with those who have totally different backgrounds properly via Zoom and text", many participants* valued their cross-cultural collaboration experience: "*Our team's diversity brought richness to our discussions, with members contributing unique insights from their country.*" In the evaluation essays, the participants described their teamwork including some concrete examples of the cross-cultural communication in their teams and their own roles. Teams benefited from diverse perspectives, despite initial challenges. Teams found cultural diversity both enriching and challenging, emphasizing the need for adaptability: "*Our Japanese teammate emphasized simplicity, while the German teammate proposed highly technical solutions—balancing these perspectives was key which enriched our solutions."* Overcoming **language barriers** and cultural differences was a key learning: "*Language barriers, like understanding accents, initially slowed discussions but ultimately improved our intercultural communication skills.*". **Flexibility and compromise** strengthened collaboration. Participants overcame hurdles like time zone differences: *"Coordinating meetings across time zones required careful planning and mutual respect."* Participants often took on **facilitative and creative roles**, ensuring team cohesion and output: "*I acted as a moderator during discussions, facilitated meetings, and ensured deadlines were met.*" Female students from Indonesia concluded that *"this challenge really opened my eyes, especially about the healthcare world*" and that it was "*very challenging and insightful*" while "*It encourages innovative thinking and practical solutions"*.

What would you do differently next time?

We asked the participants to reflect what would they do differently after having experienced the challenge: Many participants noted the need for **better role clarity**. Feedback indicated participants were se as reliable and resourceful, with **room for growth in task delegation:** "*While teammates appreciated my organizational skills, some felt I should delegate more to empower others*" and *"I would establish clear roles and expectations at the start to avoid confusion and delays."* Acknowledging the importance of **time management and project planning**: "*I underestimated the time required for thorough research, which led to rushed decisions.*"; Seeking **early feedback** was another key lesson: "*I would have started more regular feedback cycles to address friction points sooner.* Addressing conflicts with **assertiveness and diplomacy** was highlighted several times: *"When friction arose due to differing priorities, I hesitated to intervene, which I now see as a missed opportunity.*"

Comfort levels

The participants reflected upon whether they felt comfort

in this very self-reliant way of working and whether their comfort level changed during the course. Participants found the **self-reliant structure challenging but rewarding.** Many participants initially struggled but grew to appreciate the independence and ownership*: "At first, I felt uneasy without constant supervision, but I grew more comfortable as the project progressed*" and *"By the end, I appreciated the autonomy and felt more confident in my decision-making skills."* Some found comfort in their **team's support** despite the independent nature of the challenge: *"Balancing individual contributions with team collaboration became a key learning point for me."*

Lasting effects

The participants gave examples of how they would apply their learnings of the challenge in their future personal or professional life. Participants planned to implement **global collaboration and project management skills**: *"I'll apply the tools we used, like shared task boards, feedback sessions and structured workflows, task boards, and I will carry forward these to future projects."* The participants expected that their **sustainability skills** will last: "Sustainability and empathy will guide personal and professional choices." Confidence in tackling new challenges was a recurring theme. Participants **gained self-confidence through resilience and risk-taking** was a recurring theme. Participants gained in entrepreneurial confidence with remarks like: "*This challenge has inspired me to explore entrepreneurship*", "*Stepping out of my comfort zone expanded my knowledge.*" *And "I realized that we can develop a great idea if we work on it together as a team.*" And "*Making a business idea and model is quite difficult but fun.*"

Suggestions for improvement

Although many participants expressed satisfaction, stating "none," "no suggestions," or "it's already good." the following suggestions for improvement were made:

Tools and Resources (7 statements):

- Simplify tools for better usability (e.g., "Solution Explorer is a little complex").
- Provide a clearer structure and reduce overload of materials.
- Include other possible software or tools to enhance usability.
- Use more data-driven insights, particularly customer behavior and preferences.
- Reduce the volume of emails, reminders and materials
- Provide fewer but more focused resources.
- Focus on tools that align closely with project needs.

2. Teamwork and Communication (6 statements):

- Address free-rider issues in team dynamics.
- Better control to ensure all team members are contributing equally.
- Agreement from students for full commitment to the project.
- Improve communication and team adaptation strategies.
- Provide more help and training for international teams.

- Emphasize local teams for enhanced collaboration.

3. Innovation and Novelty (5 statements):

- Refine the personalization aspect with partnerships and scaling roadmaps.
- Be clearer and more detailed about expectations and future ideas.
- Make ideas more feasible and aligned with real-world implementation.
- Eliminate ideas that follow existing models to foster novelty.

4. Time Management (4 statements):

- Provide more overall time for the pitch and project phases.
- Allow better allocation of time to improve the process.
- Ensure a smoother timeline for submission and completion.

5. Participant Criteria (3 statements):

- Accept only master's or advanced bachelor's students.
- Restrict participation to extracurricular participants for better focus.
- Ensure commitment levels are explicitly agreed upon by participants.

3 Student Forum Sustainable Entrepreneurship

3.1 INTRODUCTION

As mentioned in section 1.6, one of the aims of the C4I project is to link existing modules of a similar nature (of different European universities) via virtual exchanges. This presented us with several challenges:

- University semesters in Sweden and Germany are staggered by 1.5 months.
- The focus of the involved student modules are not 100% aligned

Nevertheless, we found commonalities:

- The core of both modules is the collaborative work of students (in teams) with external challenge providers (companies) to implement sustainability-related innovations.
- In both the Sweden and German module, students are confronted with a comprehensive task that is open in its structure and allows for different solution approaches. In addition to the opportunities for self-directed learning, this also creates uncertainties and sometimes frustration.

In order to create an opportunity for SE modules from different universities to be linked and thus benefit from each other, we have designed the **Student Forum of Sustainable Entrepreneurship (Education)**. During the project period, we were able to test and pivot the organizational structure as well as the content of such forums. In the winter semester of 2023, the first SFSE consisted of two separated two-hour

online events on the topic of 'Working with a practice partner' and in the winter semester of 2024, a single two-hour online event on the method of impact forecasting was offered.

Self-guided learning and reflection upon learning is a core concept in collaborative Challenge-based Learning formats. In C4I, we use the virtual exchange to lift the students to a meta-level and discuss their needs and learning processes. In two virtual, collaborative workshops, students discussed their learning and the outcome of the workshops is a stepping stone for the students' reflection document (LiU) and the project report (UOL). C4I also gained insights about future development of student-business-collaboration formats.

First, we tested the concept in winter semester 2023 and then digested the learnings and had a second implementation in winter semester 2024. The following table gives an overview of the core details in the term.

Table 7: Facts and Figures of contributing modules

	University of Oldenburg (GER)		**Linköping University (SE)**	
Module	Sustainable Venturing (6 ECTS)		Environmentally driven business development	
Achievements:	Presentation and project report of a challenge solution		Presentation and project report of a solution to a sustainability challenge from an external partner	
	2023	**2024**	**2023**	**2024**
Schedule	Start: 26.10.2023 (Kick-off) End: 31.03.2024	Start: 22.10.2024 (Kick-off) End: 31.03.2025	Start: 28.08.2023 (Kick-off) End: 10.01.2024	Start: 03.09.2023 (Kick-off) End: 17.01.2024
No. of students in the module	10	20	15	27
No. of business partners	3	5	5	9
No. of projects	3	5	5	9
No. of students in the 1st online meeting	5	15	10	22
No. of students in the 2nd online meeting	3	Not applicable	2	Not applicable

3.2 CONCEPT

The student forum consists of different online sessions, each with a length of app. 2 hours.

The aim of the forum is to allow students to discuss their project work and its particular requirements at a meta-level and to give them the opportunity to reflect on both the task and their own learning experience. The composition of the discussion groups was prepared by the teachers.

The participants in each group came from both countries and from different projects. For each session in the forum, there were prepared key questions and points of discussion (see below). The first meeting started with a general discussion on students' projects, in which students got to know each other. In consecutive discussions, students moved to more personal experiences and standpoints.

Another aim of the participating lecturers was to learn from the students' experiences with this format, in order to improve the formats offered for the exchange between students and companies and, if possible, to embed an international exchange of experiences in the respective modules.

Table 8: Overview of Student Forum events in C4I

	Topic of session	**Methods**
1st Student Forum on Sustainable Entrepreneurship		
Meeting 1 (21.11.23), 10:15-12:00 CET	**How to work with a real business partner successfully**.	Online-session combined with online whiteboard (e.g. Mural or Miro) Group discussion in small groups (break out rooms) with guiding questions Documentation on a large (common) whiteboard World café method for presentation
Meeting 2 (12.12.23)	**Personal learning reflection (subject wise/ project wise)** **For maximum learning success – what makes a good challenge?**	Online-session combined with online whiteboard (e.g. Mural or Miro) Group discussion in small groups (breakout rooms) with guiding questions. Using "Skills Map for Collaborative Change."[10]

[10] The Health Foundation in partnership with nesta (Ed.): Skills for collaborative change. A skills map user guide. Online available under https://q.health.org.uk/resource/skills-for-collaborative-change/, last checked on 20.12.2023.

		Documentation on a large (common) whiteboard
2nd Student Forum on Sustainable Entrepreneurship		
Meeting 1 (12.11.24)	**Impact Forecasting of Student Business Challenges – Can your project make a difference?**	Online-session combined with online whiteboard (e.g. Mural or Miro) Group discussion in small groups (breakout rooms) with guiding questions. Using "Impact Forcasting"[11] as a method Documentation on a large (common) whiteboard Follow-up in each module (Impact forecasting need to be integrated into final project reports (UOL) or reflection paper (LiU)

3.3 PLAYBOOK

3.3.1 Playbook for Meeting 1.1: How to work with a real company successfully

Preparation:

- Meetings are scheduled in the course sequence, students informed about the expected benefits
- Each project group prepares a fact sheet about their project/challenge/task, a template should be provided to ensure consistency of presentation
- Fact sheets of projects are collected by the lecturers and provided to the students 1 week prior the first meeting
- The composition of the discussion groups is determined by the lecturers in advance to ensure a diverse composition.
- Lecturers prepare an online whiteboard with group areas and instructions.

[11] Fichter (2024) Guidelines for Impact Forecasting of Student-Business Challenges. (To be developed)

- Meeting link is sent to all participants

Table 9: Playbook I – Student Forum Sustainable Entrepreneurship

Duration	What	Notice
10'	Welcome! Short introduction of the forum, its goals and the overall context	
5'	Instruction 1: Your partner and challenge Each student answers the questions (silently) on the whiteboard: 1. Which partner and challenge are you working with? 2. What have been interesting working with external partners – in general and with this partner 3. How is your communication with the partner organized?	*Documentation on the shared whiteboard on post-its* *Each group is assigned an area. All students can see what is happening in all areas.*
15'	Break out session: **Roundtable discussions** Students enter the breakout room, introduce themselves and discuss question 2 and 3	*Groups of 3 students* *Lecturers are not in the breakout rooms but can be called if needed*
5'	Plenum: Explanation of next steps and 3 minutes time to answer the next questions on the whiteboard: 1. How did you specify your project with your partner company? Was it hard or easy to specify? 2. How have you found sources of information for your project? Through your partner or otherwise? Has it been easy or hard? 3. What do you prefer: Open tasks or well specified tasks? Why?	*Documentation on the shared whiteboard*
25'	Instructions 2: Break out session: **Roundtable discussions** • Present your answers • Discuss where experiences align and where they diverge	*Lecturers are not in the breakout rooms but can be called if needed*

	• Write down insights • Come back to the plenum after 25 minutes	
5'	Plenum: Explanation of World Café (How to switch rooms.)	*The World Cafe is intended to bring the students back together across groups and generate new insights.*
20'	**World Café – visitors' round:** Guests introduce themselves (5') Hosts presents what have been discussed before, similarities and divergences (5') Guests could comment and add (group discussion) (10')	*Lecturers join the discussion*
10'	Plenum: **Closing remarks** and short introduction of next meeting	

3.3.2 Playbook for meeting 1.2: Talking about the learning journey

Preparation:

- Meetings are scheduled in the course sequence, students informed about the expected benefits.
- Each participant reads out the fact sheets and results from the first meeting to recap the results of the meeting.
- The composition of the discussion groups is determined by the lecturers in advance to ensure a diverse composition. Groups differ from the composition of the first meeting.
- Lecturers prepare a new whiteboard with group areas and instructions.
- Meeting link as well as whiteboard link is sent.

Table 10: Playbook II - Student Forum Sustainable Entrepreneurship

Duration	What	Notice
10'	Welcome! Short wrap up of first meeting	
5'	Instruction 1: **Learnings from your project work** Each student answers the questions (in silence) on the whiteboard: What have you learned, apart from things about your project, when working with an external company? • Learnings about your future work life? • Learnings about working with people who have a different academic background? • Learnings about how to start –> work (–> and conclude) a project?	*Documentation on the shared whiteboard*
15'	Break out session: Students enter the room and present themselves and what project they have been working on They present their thought, discuss similarities and ideas (write new post-it's when needed)	*Groups of 3 students* *Lecturers are not in the breakout rooms but can be called if needed*
5'	Plenum: Explanation of next steps and 3 minutes time to answer the next questions on the mural board: Instructions 2: **What have you personally learned about yourself, when working with a project and an external company?** • Learnings about your strengths / weaknesses? • Learnings about what role(s) you assume in teamwork? • Thoughts on what kind of work setting you would prefer in your future work life? (and is that the same as you act as a student?)	*Documentation on the shared whiteboard*
20'	Break out session: **Roundtable discussions** • Present your answers	*Documentation on the shared whiteboard*

	• Discuss where experiences align and where they diverge • Add post-its if you think of new things • Come back to the plenum after 20 minutes	*Lecturers are not in the breakout rooms but can be called if needed*
10'	Plenum: **Short Introduction of "The Skills for Collaborative Change Map"** Instruction 3: • Put your post-it's from instruction 2 next to the corresponding skill (s) • Take 10 minutes time in the group and discuss what you see: thoughts, similarities, differences • Ask questions if you find your speaking partners interesting!	*Skills Map used without inner hexagon*
15'	Plenum: Introduction of new layer: Think about: • "How are your "feelings" for these different areas of skills? • Would you like to improve yourself in one or several skills? How? • Write down your thoughts on new post-its (2min)	*Adding an inner hexagon "Feelings: what would you like to improve? How?"* *(deviating from the original tool)*
10'	Now for a final round of discussion: **Give examples of how to improve each of the three areas**	*Lecturers are joining the discussion*
5'	Plenum: **Closing remarks**	

3.3.3 Playbook for Meeting 2.1: Impact Forecasting Student Business Challenges

Preparation:

- Meeting is scheduled in the course sequence, students informed about the expected benefits.
- Each participant registers at least one week in prior of the event on a prepared collaborative white board, leaving a sticky note with name, project and expected outcome of the project
- The composition of the discussion groups is determined by the lecturers in advance to ensure a diverse composition. Each discussion group consists of students from both universities representing different projects.
- Lecturers prepare a new whiteboard with group areas and instructions.
- Invitation with meeting link as well as whiteboard link is sent out to students.

Table 11: Playbook III - Student Forum Sustainable Entrepreneurship

Time	What	Notice
10'	Welcome! Short presentation of context and meeting agenda	
10'	Input: Impact Forecasting of Student-Business Challenges	*Introducing the concept of logic models (Input-Output-Outcome-Impact) and the benefit of impact forcasting*
17'	**First round of discussion – OUTPUT** Break out session: Students enter the room and present themselves and what project they have been working on and the expected outcome (delivery) of the project (max 3' each) Discussion of differences and similarities in different outputs	Groups of 4 students Teachers prepare the room in advance, sticky notes from the preparation board are placed at the "tables" of the session board, a list of names for the breakout rooms is presented in plenary. Students enter the breakouts independently.

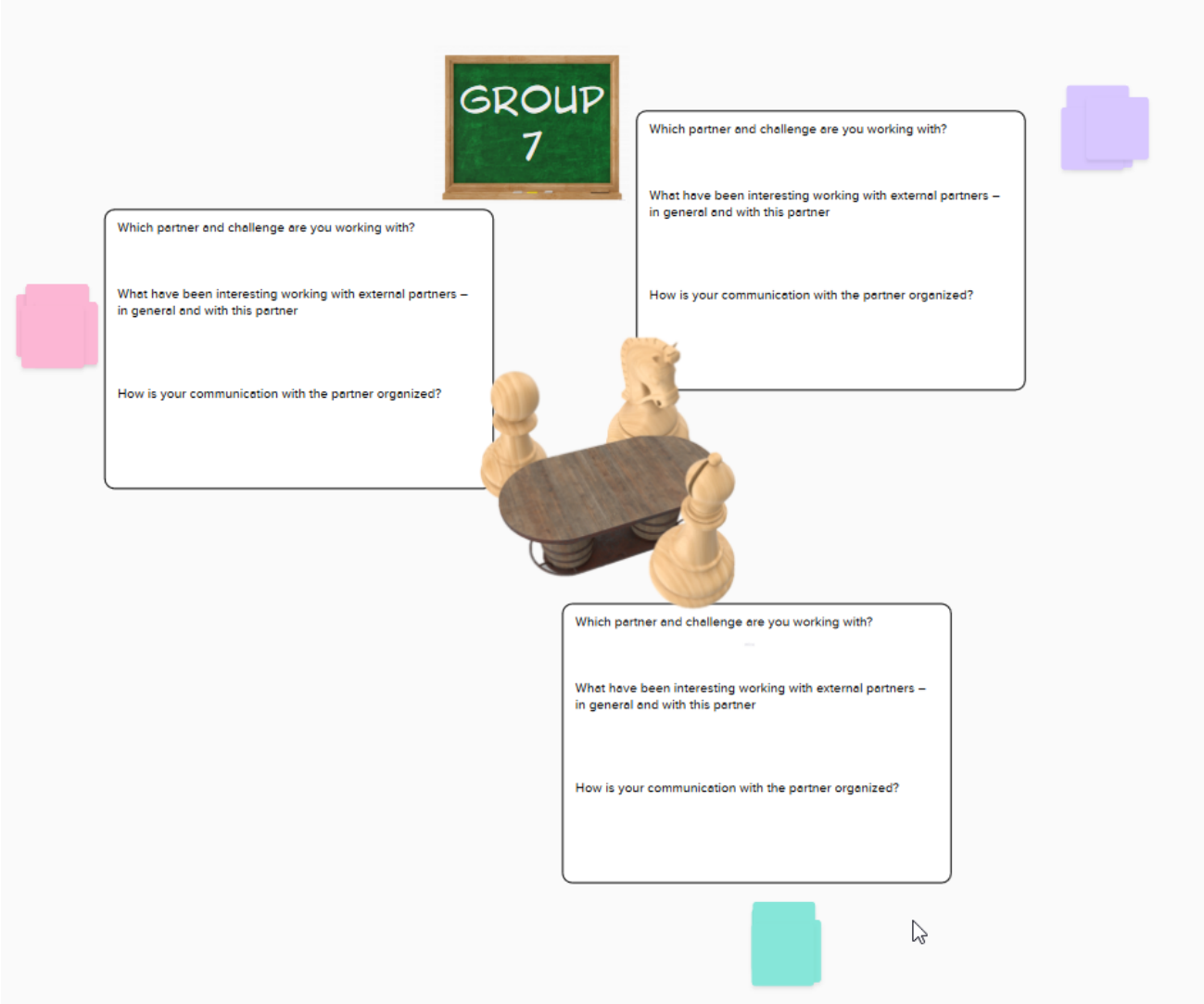
Time	What	Notice
8'	Short presentation: Explaining/ classifying OUTCOME While in the main room, students write down the main possible outcome of their project (silently, 3 min)	Sticky notes on the board, new section
20'	**Second round of discussion OUTCOME** In the breakouts: present outcome (1 min), discussion on outcome (4 min)	Slide of explanation placed on the white board
5'	Short presentation: Explaining Impact While in the main room, students write down the main possible impact of their project and an idea about a possible indicator to measure impact (silently, 3 min)	Sticky notes on the board, new section
20'	**Third round of discussions – IMPACT** In the breakouts: present impact (1 min), discussion on impact (4 min)	Slide of explanation placed on the white board
15'	Plenum: Final conclusion and closing remarks How will this exercise be integrated into the final papers/reports	

3.4 TEMPLATES

3.4.1 Collaborative whiteboard (Meeting 1.1)

For facilitation, we worked with a common whiteboard on mural.co. For each subgroup an area was reserved, sticky notes prepared by the side.

Figure 4: Group area on collaborative whiteboard in meeting 1, session 1



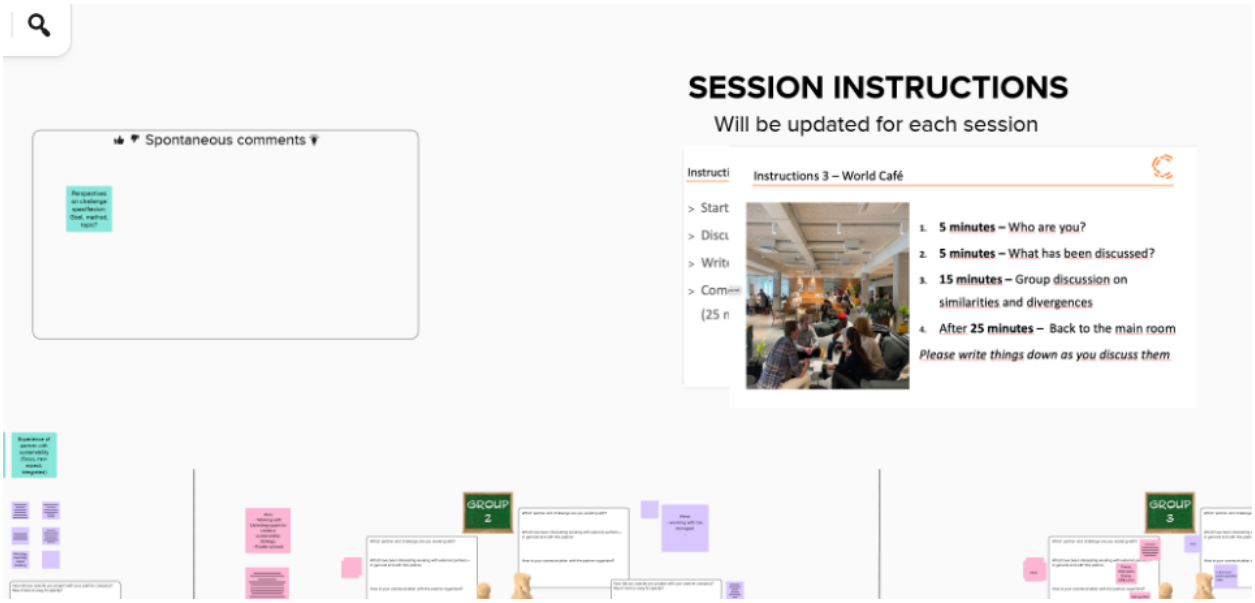
The overall whiteboard also contained an area called “playground”, where students lacking experience using collaborative whiteboards could test functionalities before the session.

The advantage of a single large whiteboard lies in the preparation and easier handling. Content can be easily duplicated, only one link needs to be sent to the entire group of participants, groups do not necessarily have to be formed in advance and changes in the group composition have no effect on the

assignment of the respective group-specific whiteboard. An advantage during the workshop proceeding is that students can see the activity of other participants while they are working on the whiteboard themselves. This supports the feeling of collaborative work in the group as a whole.

Instructions given in the meeting room have been posted on the mural board again to lead through each section of the forum.

Figure 5: Detail from the whiteboard with instructions

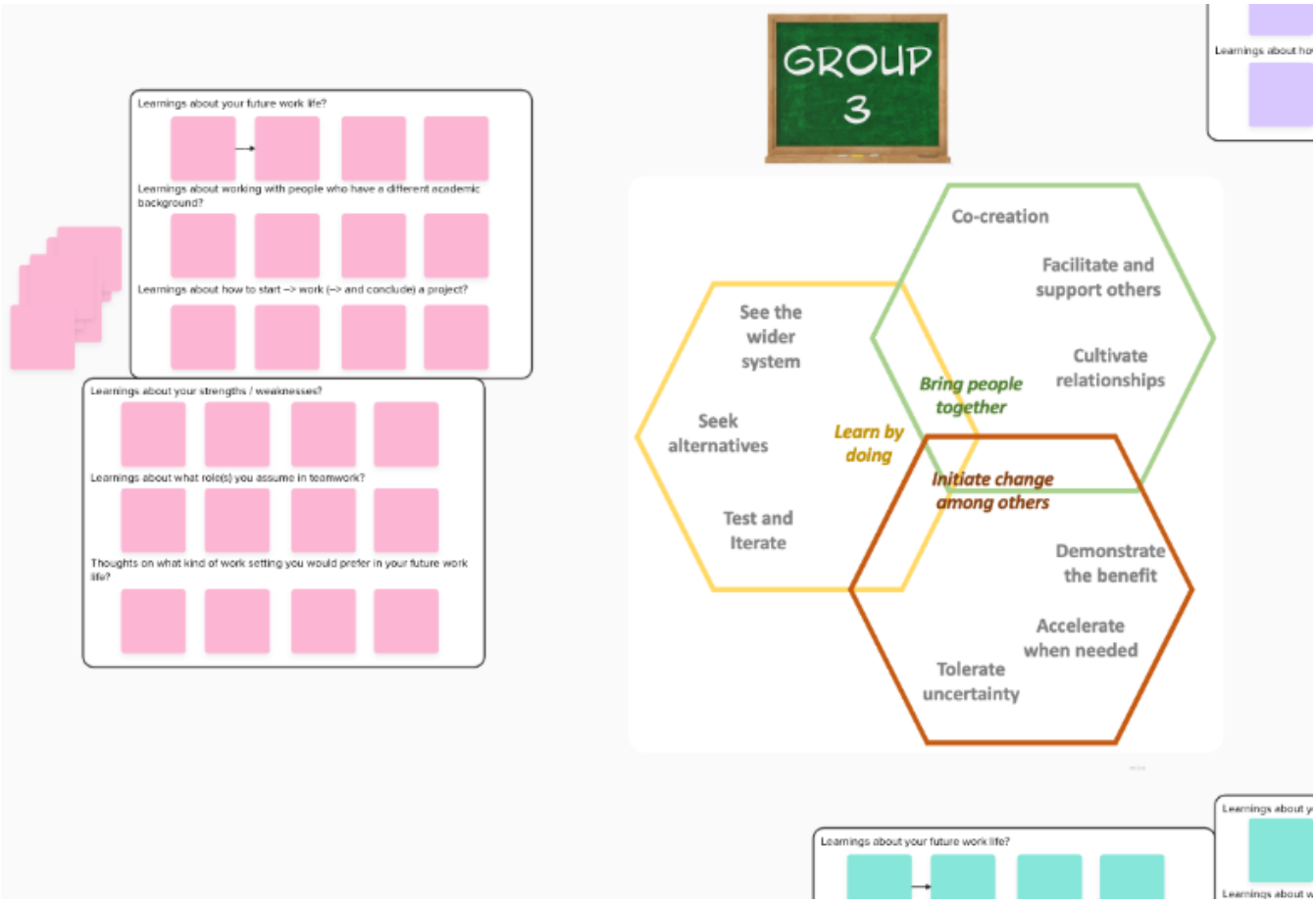


For the second meeting of the student forum a new mural board was set up. Therefore, the first whiteboard could remain for documentation and recap for the students.

3.4.2 Collaborative Whiteboard (Meeting 1.2)

The basic structure of the second mural board is identical to the structure of the board from the first meeting. Each group has a separately labelled area on the shared board. To answer the questions in the starting round, we prepared a very simple template and duplicated it according to the number of groups and participants.

Figure 6: Details from whiteboard, meeting 1.2



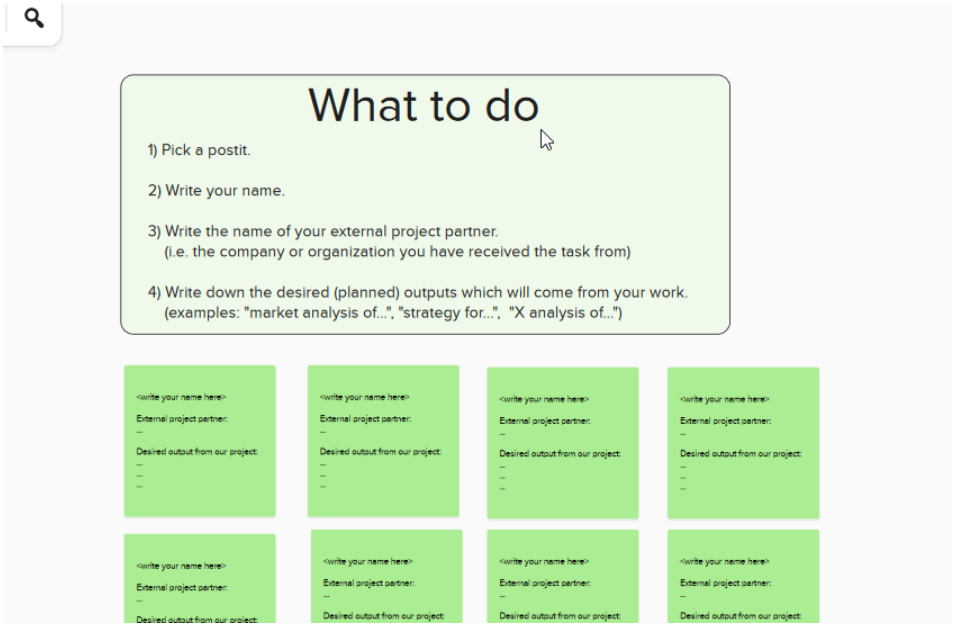
This preparation saves a lot of time in the group phases and reduces the likelihood of students getting lost in the functions of the whiteboard or accidentally destroying prepared templates.

For the second part of the discussion, we used the template for the skills map in a simplified form on the whiteboard.

3.4.3 Whiteboards of Meeting 2.1

For the 2nd Student Forum we have prepared two boards on mural.com. First board was used for preparation.

Figure 7: Board for registration of participating students



A second large mural board was set up for the Student Forum itself. Therefore, each group got his own space on the shared board, within each space three sections had been prepared, one for each breakout ("wandering from top to down). In order to ease the discussion, also slides of the presentation were put on the board.

Figure 8: Mural board of 2nd Student Forum

3.4.4 Skills for collaborative change – a skills map

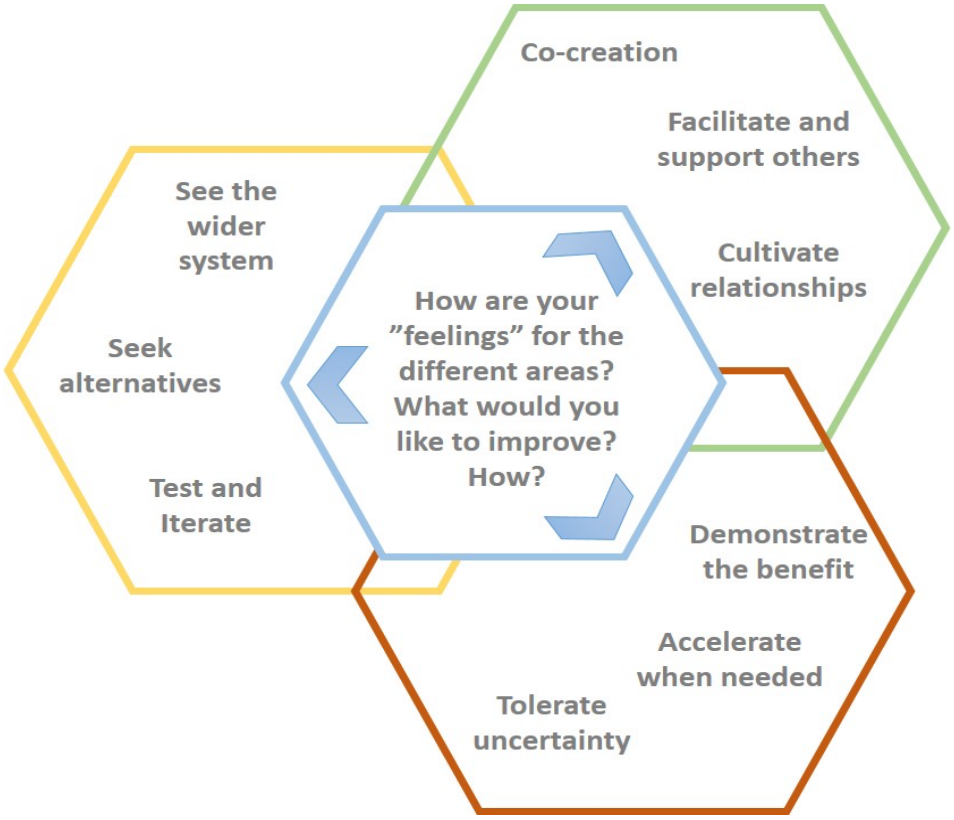
To reflect on the skills acquired in the module, we used the skills map of the Q-Community led by the Health Foundation and NHS Improvement of the UK. The framework of the map was created to support individuals and teams in discussing skills and attitudes that are necessary for collaboration and creative problem solving (The Health Foundation in partnership with nesta, p. 6).

Figure 9: Skills for collaborative change - Skills Map (The Health Foundation in partnership with nesta, S. 7)

It seemed to be useful to give students a structure to think in certain categories. In this project, we concentrated on the “outer” hexagons, namely the skills.

As “attitudes” itself was not a point of discussion we added the layer “feelings about my skills” to stimulate discussion about strength and weaknesses and improvement of skills.

Figure 10: Adopted skills map (Source: Own processing)



3.5 EVALUATION

3.5.1 First Student Forum 2023

The Student Forum was planned as part of the modules at the University of Oldenburg and at Linköping University and was integrated into the course schedule accordingly. Nevertheless, the students saw the event as an "extra" appointment, which prevented some students from attending (difficulties in scheduling).

A separate evaluation was not planned due to the setting and the short duration of the event.

The module at Linköping University includes a reflection essay as part of the examination. The Student Forum is intended to prepare this essay. This is not the case in the module at the University of Oldenburg. Here, the students were asked for oral feedback in the next course.

1) Feedback from students

In the following session, students were asked to give their fellow students who were not present at the forum a brief overview of the activities and to provide feedback on the event. As only a very small number of students took part in the Student Forum in winter 2023, the following feedback should only be taken as an example:

- It was interesting to meet students from another university with similar teaching offers (student business collaboration) and see similarities and differences.
- I got some good tips for project work and communication with business partner/ challenge provider.
- It was fun.
- The Forum took place at an early stage of our project work. It would have been interesting to discuss all the questions at a later point in the term.
- The meeting focusing on skills was more interesting than the first meeting. More personal and developing for me.

2) Feedback from lecturers/facilitators

The workshop setting worked well (questions, playbook/method as well as facilitation online). We could see a lively discussion although students didn’t know each other before.

The value of self-reflection was recognized and strengthened by the students. This type of reflection has so far been neglected in both modules offered separately and should therefore be integrated more strongly in the future.

The networking of independent teaching modules from two different European universities was easy to realize and required little preparation. The benefit for the students lies in familiarizing themselves with similar teaching concepts, their conditions and implementation and thus gaining a "broader perspective".

It was harder to integrate the subject of the modules (entrepreneurship and innovation) into the exchanges. As the German semester started later than the Swedish, the progression of the projects were constantly misaligned. Interactions which would have benefited one module were either too early or too

late for the other module. This we could see on the student feedback of the first meeting, where German students found it interesting, but would rather have had the meeting later on in the module.

3.5.2 2nd Student Forum 2024

1) Feedback from students

Students from UOL were asked to give feedback via the survey tool mentimeter.com. They were asked to

- Rate on a scale from 1 (not interesting at all and very useless) to 10 (very interesting and useful): 13 students participated in the poll and answered with 6.1 average. Answers were spread from 4 to 10, so the benefit was assessed different.
- State what they liked: Answers are concentrating on the aspect of meeting and discussing with Swedish students and getting to know their projects as well as different views on outcome and impact of projects. It was also mentioned, that content wise the Student Forum did not help to move on within the project challenges, because the represented projects in the group had been so different.
- Give ideas for improvements: some ideas have been mentioned that are worthwhile to consider: Introducing the method of impact forecasting beforehand so everybody would be prepared; more time to discuss or changing of groups to get to know also other projects; trying to match students from groups with similar content to learn more from each other.

Students from Linköping filled in a Forms document after the meetup with the same questions and scales as the German students.

- Only 5 students answered the poll. We assume the low attendance was due to the poll being sent out after and not being part of a lecture. The students were content with the meetup, on an average of 7,2 (two rating it 6 and three 8).
- Students liked meeting other students, and thought it to be “fun” to engage with students from a different country. One student liked the format of the workshop, with short breakouts and clear tasks to be done. Only one student mentioned the content as something she/he found interesting.
- Ideas for improvements were: More clear instructions in the Mural, not only in the meeting. Somewhat inconsistent time management for the different tasks – some needed more time and some less.

2) Feedback from lecturers/facilitators

The workshop worked well, as last time the engagement was high among the students and discussions seemed lively. Although the number of students were higher this year, the workshop setting worked well and although some students did not show up, and yet other ones had not done the preparations, the forming of groups went well. The setup was easier to be agile in than in prior workshops, as the students could move themselves into breakout rooms when needed.

The content of impact assessment seemingly engaged the students. The theories were new for both student groups and the timing were good for both groups which was a good prerequisite for discussions.

4 CONCLUSIONS

4.1 FINAL REMARKS

Both, the “Future of Healthcare Challenge” and “The international virtual Student Business Forum” were well received at the students. For teachers, it provided the modules with international outlook and strengthened connections with other teacher teams.

Enhancing self-reflection with new perspectives outside the everyday work of students was beneficial for the outcome of the reflection reports as well as giving input to students in the ongoing work. The format will be further developed to encompass facets of the subject of the modules.

This format of short interactive meeting between student groups would serve a purpose in all subjects where students are helped by comparing and interacting with students from other countries and disciplines, but still studying the same subject.

Still, the central question remains: How to maximize the benefits for all participating students, regardless of where they are in their project challenge.

4.2 GENERAL RECOMMENDATIONS FOR TEACHERS

1. Make sure to integrate the “Future of Healthcare challenge”or „Student Forum on Sustainable Entrepreneurship“ the into your course schedule.
2. Let students commit beforehand (short presentations/ fact sheets of their projects, post-it on collaboration board).
3. Invite students separately to this event, introduce in teaching session and show a clear benefit.
4. Give guidance and input during the session and have prepared a well-structured collaboration board.
5. Make the sessions highly interactive.
6. Have a timer handy to secure proper time management.
7. Plan a follow-up to integrate the results of the online-event into the course achievements
8. Track feedback and satisfaction of students as well as possible effects of the Student Forum.
9. Discuss the theme “intercultural collaboration” before collaborating intensively virtually with students from other cultures

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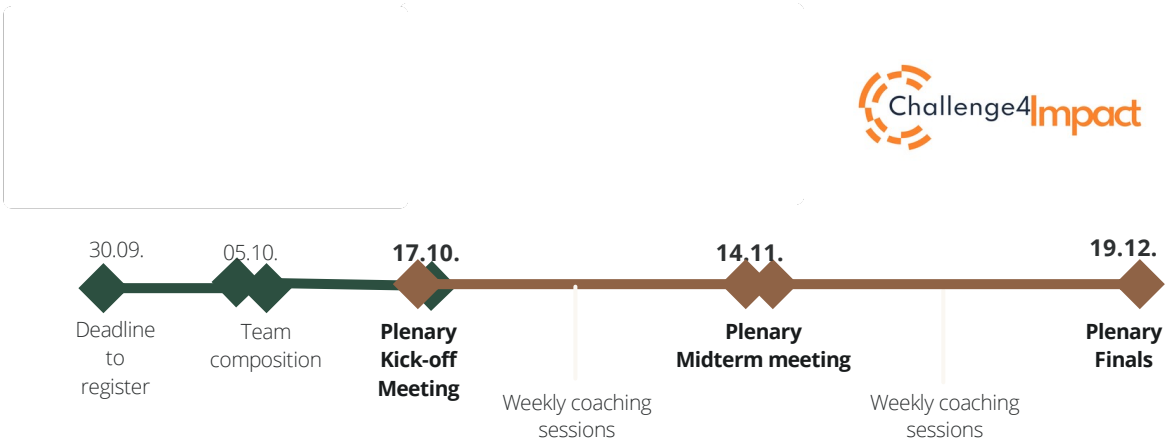
Appendix 3: Promo Leaflet FHC2024



The International Future of Healthcare Challenge 2024 is an exciting partnership with Johnson & Johnson Sustainable Solutions.

THE CHALLENGE:

Invent and develop new and feasible Circular Business Models for healthcare or pharmaceutical products.

THE PARTNER:

Johnson & Johnson is one of the world's largest healthcare products companies. Johnson & Johnson Sustainable Solutions values new ideas and is passionate about sustainability. The people at J&J have immense expertise in early-stage innovations. Throughout the program, people at J&J will serve as the student teams' technology and marketing partners. They will provide technical and practical advice to the student teams from their professional viewpoints about the healthcare markets and relevant technologies.

Learn about creativity, innovation and act like an entrepreneur!

In an online collaboration space, you will develop ideas, spot opportunities and test how your ideas could entry into the market. You solve environmental problems with an international and multidisciplinary team of entrepreneurial students from European, and Asian universities.

You work with specialists at J&J and will be coached by staff from participating universities.

You will get to know tools and methods for ideation and sustainable business model development and learn to apply them.

All participants will be serviced with a Challege4Impact Certificate.

THE WINNER:

The team with the best idea will be **awarded** the

J&J Future of Healthcare Innovation Award 2024

MORE:

- about Johnson & Johnson & sustainability

Product pitches from former Future Challenges:

- Example: "Micro Plastics Blood Filtering"
- Example: "Emission reduction while generating energy"

INTERESTED?

Write me why you want to participate and make sure you get a place in the team!
stel@createnewbusiness.com

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

Organized by: Vennebroek Academic Services

Powered by www.solution-explorer.de

APPENDIX 3: QUALITATIVE FEEDBACK FHC2024

For this evaluation, we received 10 evaluation essays of from Italian, Indonesian, South African, and Nigerian participants and we distilled in total 48 "eye opener" statements from the ex post questionnaire. The key themes from the participants' experiences, highlighted their take aways Waste, Sustainability, and Circular Business (18x), Cross-Cultural and Cross-Disciplinary Teamwork (19x) and Personal Entrepreneurial Growth (11x). To illustrate our conclusions, we report some statements as well.

EYEOPENERS

1. Participants gained insights on **waste issues**, such as:

   "Discussing how pharmaceutical waste is handled in our home countries helped us design a globally viable solution."

   "Recycling unused medications could reduce waste, save resources, and promote responsibility among consumers."

   "The scale of waste generated in healthcare and the potential for business solutions to manage it effectively."

   "Collecting the waste of medicine."

   "How much waste is generated, and no one is thinking about what to do with it. The business opportunity in managing waste."

   "Reducing waste, time for waiting and going to pharmacies, and reducing cost."

   "Less waste, less polluted nature, more access to medications, less money wasted."

   "Addressing pharmaceutical waste through proper recycling practices."

2. Some take aways on awareness and addressing of **healthcare** were mentioned:

   "This challenge opened my eyes to the big problem of unused and expired medications harming the environment and public health. It showed me how important it is to find ways to recycle these medications to reduce waste and save resources."

   "The importance of addressing healthcare gaps, like improving access to medicines for underserved communities."

   "The growing demand for personalized health solutions and how sustainability is central to consumer decision-making.".

   "What needs to be done within healthcare and pharma: huge impact is possible, but it's very hard as the focus on money is very great."

   "The fact that many people still have a hard time accessing medicine."

"*The healthcare problems people are facing on a global and local scale and its specificity on localized healthcare gaps.*"

"*Better healthcare access through innovative systems.*"

"*Many patients who need epinephrine are helped by the subscription and reusable system that makes it easier for them to get goods and cheaper.*"

3. The challenge revealed the importance of **global awareness of circular economy and sustainability**:

" *I've gained a deeper understanding of the circular economy, its principles, and its potential to address environmental and social challenges.*"

"*The shift towards eco-friendly practices in every aspect of the business, from packaging to ingredient sourcing, highlighted the need to align sustainability with health goals.*"

"*New technologies, like tools to track expiration dates, can improve how we manage healthcare and protect the environment.*"

"*That there are a lot of ways to be more sustainable, and even if it's hard at first, it gets easier.*"

"*Understanding the Circular Economy and its potential to address environmental and social challenges.*"

4. Regarding the most important personal learnings in the challenge, participants emphasized the value of **cross-cultural and cross-disciplinary collaboration** in generating innovative solutions. Empathy and adaptability were considered crucial in cross-cultural teamwork:

"I learned to listen actively and appreciate diverse perspectives, which enriched our discussions."

"Adapting to cultural differences taught me to value inclusivity and patience in collaboration."

"*The challenge taught me to navigate cultural nuances and interpersonal dynamics professionally.*"

"*I realized how critical interdisciplinary collaboration is in generating effective solutions."*

"*Even though I didn't have technical knowledge, I contributed ideas that considered human behavior and practical solutions.*"

"*It is really important to communicate openly and address problems directly*"

"*The importance of global collaboration.*"

Although it was not easy**:** "*How difficult it is to communicate with those who have totally different backgrounds properly via Zoom and text"*

Many participants valued their cross-cultural collaboration experience:

"Working with teammates from different continents taught me how to adapt to diverse cultural norms and expectations."

"Our team's diversity brought richness to our discussions, with members contributing unique insights from their country."

"I learned discussing with teammates from many different continents"

Teamwork

In the evaluation essays, the participants described their teamwork including some concrete examples of the cross-cultural communication in their teams and their own roles. Teams benefited from diverse perspectives, despite initial challenges. Teams found cultural diversity both enriching and challenging, emphasizing the need for adaptability:

"Our team's diversity brought richness to our discussions, with members contributing unique insights from their country".

"Our Japanese teammate emphasized simplicity, while the German teammate proposed highly technical solutions—balancing these perspectives was key which enriched our solutions."

"Initial misunderstandings due to differing communication styles were resolved through active listening and clear guidelines."

Overcoming **language barriers** and cultural differences was a key learning:

"Language barriers, like understanding accents, initially slowed discussions but ultimately improved our intercultural communication skills."

"We established communication guidelines and task boards to stay aligned despite time zone challenges."

Flexibility and compromise strengthened collaboration. Participants overcame hurdles like time zone differences:

"When discussing project priorities, we negotiated to balance technical feasibility with creative ideas."

"Adjusting to varying communication styles and approaches enhanced our teamwork."

"Coordinating meetings across time zones required careful planning and mutual respect."

Participants often took on **facilitative and creative roles**, ensuring team cohesion and output:

"I acted as a moderator during discussions, facilitated meetings, and ensured deadlines were met."

"My role involved creating graphics, multimedia content, and refining our business model canvas."

What would you do differently next time?

We asked the participants to reflect what would they do differently after having experienced the challenge:

1. Many participants noted the need for **better role clarity**. Feedback indicated participants were se as reliable and resourceful, with **room for growth in task delegation:**

   "*While teammates appreciated my organizational skills, some felt I should delegate more to empower others*."

   "*I was viewed as approachable and dependable, but my assertiveness during debates needed improvement*."

   "*Teammates appreciated my organizational skills, though I realized I needed to delegate more to empower others."*

   "*I initiated informal check-ins to build camaraderie and bridge cultural gaps, which improved team morale.*"

   "I would establish clear roles and expectations at the start to avoid confusion and delays."

2. Acknowledging the importance of **time management and project planning**:

   "*I underestimated the time required for thorough research, which led to rushed decisions.*";

   "Setting milestones early would have improved our efficiency and reduced last-minute stress."

   "Setting clear guidelines and sharing individual preferences in advance could have prevented misunderstandings."

   "I discovered the significance of proactive planning and encouraging open conversations to embrace diverse viewpoints."

3. Seeking **early feedback** was another key lesson:

   "Incorporating feedback from our coach earlier would have helped refine our approach more effectively."

   "*I would have started more regular feedback cycles to address friction points sooner.*

4. Addressing conflicts with **assertiveness and diplomacy** was highlighted several times:

"I realized the importance of speaking up confidently and addressing disagreements constructively."

"When friction arose due to differing priorities, I hesitated to intervene, which I now see as a missed opportunity."

"I would have been more assertive in presenting my ideas and advocating for my proposals.";

Comfort levels

The participants reflected upon whether they felt comfortable in this very self-reliant way of working and whether their comfort level changed during the course.

1. Participants found the **self-reliant structure challenging but rewarding.** Many participants initially struggled but grew to appreciate the independence and ownership*:*

   "At first, I felt uneasy without constant supervision, but I grew more comfortable as the project progressed."

   "At first, the lack of constant supervision was intimidating, but it ultimately taught me to trust my judgment."

   "By the end, I appreciated the autonomy and felt more confident in my decision-making skills."

   "By the end, I appreciated the independence, as it allowed us to take full ownership of our work."

2. Some found comfort in their **team's support** despite the independent nature of the challenge:

   "Regular team check-ins helped me navigate uncertainty and build confidence."

   "Balancing individual contributions with team collaboration became a key learning point for me."

Lasting effects

The participants gave examples of how they would apply their learnings of the challenge in their future personal or professional life.

1. Participants planned to implement **global collaboration and project management skills**:

   "I'll apply the tools we used, like shared task boards, feedback sessions and structured workflows, task boards, and I will carry forward these to future projects."

   "I will prioritize clear communication and leveraging diverse perspectives in my next group assignments and professional settings"

2. The participants expected that their **sustainability skill**s will last:

"Sustainability and empathy will guide personal and professional choices."

"*I aim to advocate for eco-friendly practices and foster inclusivity in every team I work with.*"

"*The emphasis on user-centered design taught me to approach challenges with empathy and creativity.*"

"I aim to foster inclusivity and use empathy as a cornerstone for future team environments."

"The lessons on sustainability will guide me in advocating for eco-friendly practices in my studies and career."

5. Confidence in tackling new challenges was a recurring theme. Participants **gained self-confidence through resilience and risk-taking** was a recurring theme. Participants gained in entrepreneurial confidence with remarks like:

"In the future, I'll approach such situations with more confidence."

"*This challenge has inspired me to explore entrepreneurship.*"

"Winning second place boosted my confidence and showed me my entrepreneurial potential."

"*Making a business idea and model is difficult but fun.*"

"*Stepping out of my comfort zone expanded my knowledge.*"

"*Balancing this challenge with other responsibilities taught me time management.*"

"*This is a valuable experience.*"

"*Speech and commitment issues are hard.*"

"*Leading a critical presentation despite my doubts helped me trust my instincts.*"

"*I shifted my focus from seeking validation to delivering the best results I could.*"

"*This experience taught me to approach unfamiliar tasks with curiosity and a solution-oriented mindset.*"

"The experience taught me to embrace mistakes as part of the learning process and to believe in my abilities."

"*I learned that making mistakes is part of the learning process and helps in gaining confidence.*"

"*By presenting ideas, even with hesitation, I realized that my contributions were valued.*"

"Leading a critical presentation despite my doubts was a turning point in my personal growth."

"Cross-cultural preparation and coaching are key elements"

"I realized that we can develop a great idea if we work on it together as a team."

"*Making a business idea and model is quite difficult but fun.*"

"*The student can develop the idea quite good.*"

"*To think about customer incentives.*"

"*We have really different points of view, how we worked efficiently as a team.*"

"*How participants accommodated each other's time zones for meetings.*"

"*How different people coming from different countries can come together to find a mutually beneficial solution to some of our day-to-day challenges.*"

"*The power of interdisciplinary collaboration in tackling global challenges like circular economy models in pharmaceuticals*

"*Language barriers, like understanding accents, initially slowed discussions but ultimately improved our intercultural communication skills.*"

"*Adjusting to varying communication styles and approaches enhanced our teamwork.*"

"*How different people coming from different countries can come together to find a mutually beneficial solution to some of our day-to-day challenges.*"

Suggestions for improvement

Although many participants expressed satisfaction, stating "none," "no suggestions," or "it's already good." the following suggestions for improvement were made:

1**. Tools and Resources (7 statements):**

- Simplify tools for better usability (e.g., "Solution Explorer is a little complex").
- Provide a clearer structure and reduce overload of materials.
- Include other possible software or tools to enhance usability.
- Use more data-driven insights, particularly customer behavior and preferences.
- Reduce the volume of emails, reminders and materials
- Provide fewer but more focused resources.
- Focus on tools that align closely with project needs.

2. Teamwork and Communication (6 statements):

- Address free-rider issues in team dynamics.
- Better control to ensure all team members are contributing equally.
- Agreement from students for full commitment to the project.
- Improve communication and team adaptation strategies.
- Provide more help and training for international teams.
- Emphasize local teams for enhanced collaboration.

3. Innovation and Novelty (5 statements):

- Refine the personalization aspect with partnerships and scaling roadmaps.
- Be clearer and more detailed about expectations and future ideas.
- Make ideas more feasible and aligned with real-world implementation.
- Eliminate ideas that follow existing models to foster novelty.

4. Time Management (4 statements):

- Provide more overall time for the pitch and project phases.
- Allow better allocation of time to improve the process.
- Ensure a smoother timeline for submission and completion.

5. Participant Criteria (3 statements):

- Accept only master's or advanced bachelor's students.
- Restrict participation to extracurricular participants for better focus.
- Ensure commitment levels are explicitly agreed upon by participants.