EntRENEW

Intellectual Output 1: Pedagogical Methodology

AUTHOR: IRENE BECCARINI, EMLV - ALDV

Document information

Document title	Intellectual Output 1: Pedagogical Methodology
Document file name	Intellectual Output 1: Pedagogical Methodology
Revision number	
Issued by	
Issue date	
Status	

Nature of the deliverable

R	Report	X
P	Prototype	
D	Demonstrator	
O	Other	

Dissemination Level

PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	x

Document Approval

Name	Role in the project

Document Review

Date	Version	Reviewers

Acknowledgement

Table of Contents

1. Introduction

The "Entrepreneurship for Renewable Energy" (EntRENEW) project aims at promoting a dynamic interdisciplinary perspective that articulates the corporate, scientific, and pedagogical skills and knowledge in renewable energy and entrepreneurship. EntRENEW will contribute to increase the knowledge and the know-how of European students on their path to become effective entrepreneurs and leaders, by enabling them to address the challenges of Europe`s sustainable development and the energy sector's transition towards decarbonization — as part of the European Green Deal.

The project will reach its objectives, first of all, by the creation and diffusion of a blended-learning course tailored to the needs of target groups in the field of entrepreneurship in renewable energy. The EntRENEW course will be based on hybrid courses mixing face-to-face interactions with online learning (discussion boards, wikis, podcasts, and iMovies), gamification (the use of game elements in non-game contexts such as academic learning), experiential learning and case studies (PBL – problem-based learning). Second, the project will create an incubation hub to incubate students' innovative start-ups.

The long-term impact will be to create a new generation of decision makers who will explore concrete entrepreneurial solutions in support of EU countries facing the important challenge of maintaining their social and economic performance while being more eco-responsible, especially in terms of energy.

1.1.   Project target needs

The project addresses three major needs:

NEED 1: The need to form new skills and competences in future master's graduates in business and environmental studies, bridging the current knowledge gap in higher education curricula and so as to address the current demands of energy businesses.

NEED 2: The need to foster the use of innovative pedagogical tools and frameworks in higher education so as to enhance students' motivation.

NEED 3: The need to enhance the collaboration between European students and the entrepreneurial community.

1.2.   Project objectives

The project seeks to achieve the following three specific objectives (SO):

SO 1: FACILITATE THE EXCHANGE, FLOW AND CO-CREATION OF NEW KNOWLEDGE
By bringing together five leading universities and one technical company in the field of innovative and sustainable entrepreneurship and energy studies, the project will create a higher education course in Entrepreneurship in Renewable Energy (ERE) tailored to deepen the technical knowledge of students with business background and strengthen the entrepreneurial mindset and skills of students from engineering majors.

SO 2: ENABLING PROFESSORS TO TEACH TRANS-DISCIPLINARY STUDIES THROUGH INNOVATIVE METHODS AND IT TOOLS

The content of the course will be inter-disciplinary and cross-sectoral, so as to foster a direct link between higher education and the business world. At the same, the project will develop an innovative teaching methodology based on blended-learning and gamification.

SO 3: STIMULATE SYNERGIES BETWEEN UNIVERSITIES AND ENTREPRENEURIAL SUPPORT SYSTEMS THROUGHOUT EUROPE

By developing content tailored to address the needs of new energy-based businesses, the project will improve students' future integration into the labor market and it will grant master students training and access to relevant networks in Europe (e.g. startup hubs in climate change and entrepreneurship, etc.). At the same time, the increased relationships between universities and businesses will lead to an increase in entrepreneurship initiatives in Europe in the field of renewable energy.

1.3.   Project duration and organization

The project will last thirty-six months. It will be divided in six working packages involving the management and implementation of different activities. It will lead to five Intellectual Outputs (IO) and five national multiplier-events with prominent international guests and short demo sessions.

The project consortium is composed by:
- ASSOCIATION LEONARD DE VINCI (ADLV), Paris, France
- UNIVERSITAT POLITECNICA DE VALENCIA, Spain
- HOGSKOLAN I HALMSTAD / Halmstad University, Sweden
- STICHTING VU / Vrije Universiteit Amsterdam, the Netherlands
- VAASAN YLIOPISTO / University of Vaasa, Finland
- Evroproject OOD / Europroject, Bulgaria

1.4.   Project methodology

Figure 1 summarizes the different phases the project will go through in order to reach its objectives.
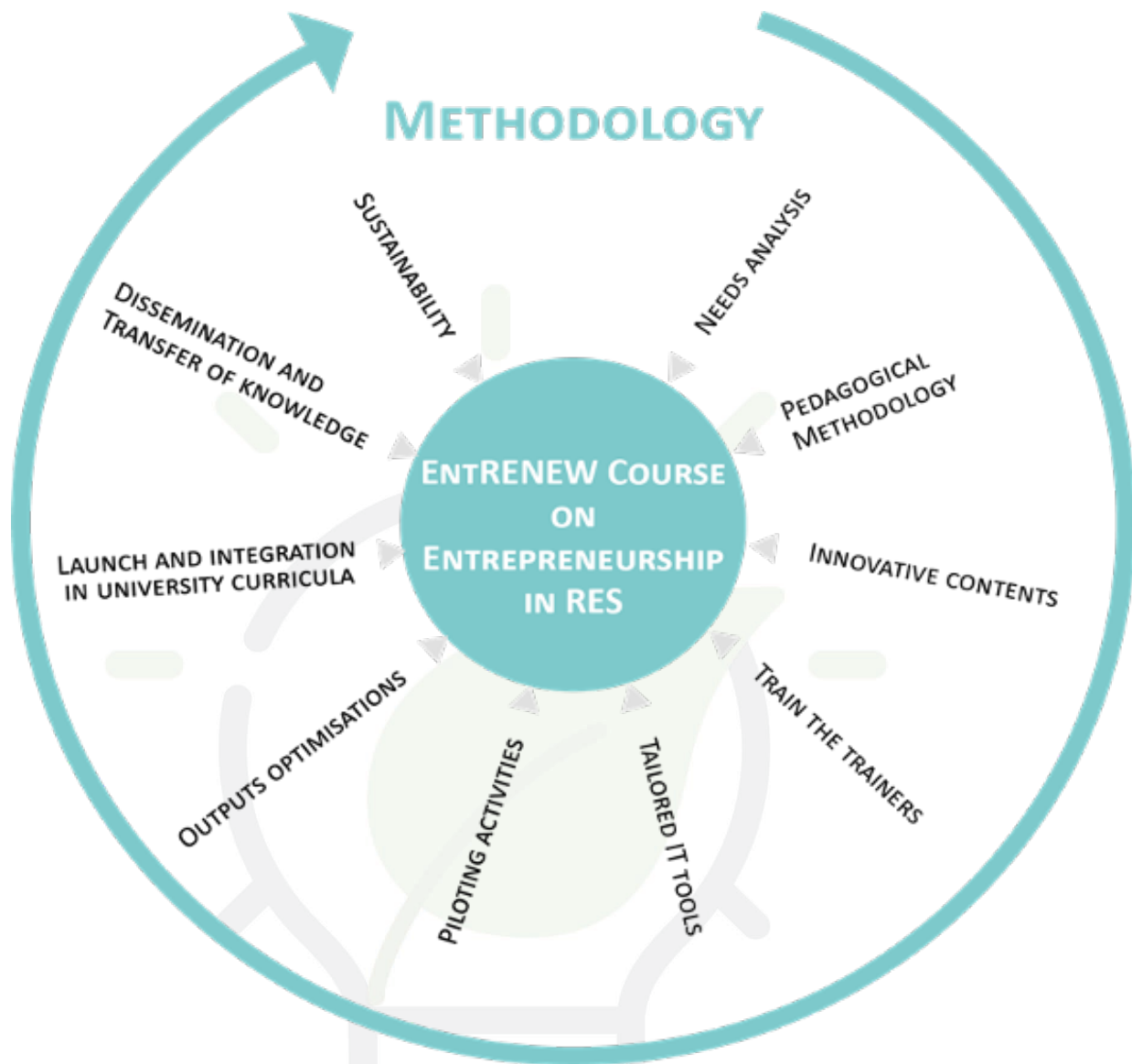
Figure 1. Project methodology

Concretely, these phases converge into five sequential work packages (WPs):
1) WP1: Methodological approach definition and design
2) WP2: Pedagogical content development
3) WP3: Development of the e-learning platform
4) WP4: Testing and launch of the EntRENEW blended learning course in entrepreneurship in the renewable energy sector
5) WP5: Dissemination and exploitation.

The work package 6 — project management and quality control— is developed transversally along all the different phases.

2. WP1: Definition and design of the methodological approach

The work package 1 aims at specifying the educational and training content of the EntRENEW blended course and incubation hub. It constitutes the backbone of the project and designs the structure and the content outline of the EntRENEW course so as to increase the training efficiency and attractiveness to students.

To this end, work package 1's main tasks involve:
1. An analysis of the needs of target groups.
2. The definition of the EntRENEW course's learning objectives.
3. The definition of the EntRENEW course's pedagogical approach.
4. The definition of EntRENEW course's structure.
5. The definition of EntRENEW course's content outline and modules.
6. The external validation for EntRENEW course' learning objectives, structure, and content outline.

2.1. Needs analysis of target groups

The project EntRENEW aims at building a programme in sustainable entrepreneurship applied to the energy transition. In order to ensure the relevance, impact and sustainability of the programme, the project incorporates the empirical results of previous literature on interests and resistance towards climate change. Following this literature and using its analytical tools, the project examines   the intrinsic and extrinsic motivations that drive a young person to join a programme in entrepreneurship in renewable energy, as well as the motivations that drive a teacher to lead it and an institution to enhance its contents. In addition, it will observe what impact such a programme has in enhancing motivation among its participants.

2.1.1. Background on interests in and resistance to climate issues

In 2011, Poortinga et al. (2011) studied European citizens' attitudes towards climate change. They found that people's belief in the existence of climate change was not correlated with awareness of its impact. In contrast, in the 2016 European Social Survey run in 23 EU countries, respondents made a clear link between climate change and energy supply issues. The countries with the lowest levels of concern about the affordability of energy were Sweden, Iceland, Switzerland, and Norway. These countries had less than 15% of respondents who reported being very or extremely concerned "that energy may be too expensive for many people" in their country. In the report "European Attitudes to Climate Change and Energy" (2018) of the 2018 European Social Survey, experts examined the relationships between climate change individual perceptions and energy security concerns on the one hand, and energy preferences on the other. Results of this study showed that the feelings of personal responsibility (personal norms) were highest in Western European countries, such as France and Switzerland, and lowest in the Czech Republic and the Russian Federation.

Besides country variability, research shows that different personality traits, levels of perception (awareness), and behaviors associated with them also play a role in people's perception and attitudes towards climate change. Stern's value-belief-norm model (2000) provides a set of crucial insights in the value chain that characterizes human behaviors in their persuasion/engagement process vis-à-vis climate issues and their implications (see Fig. 2).
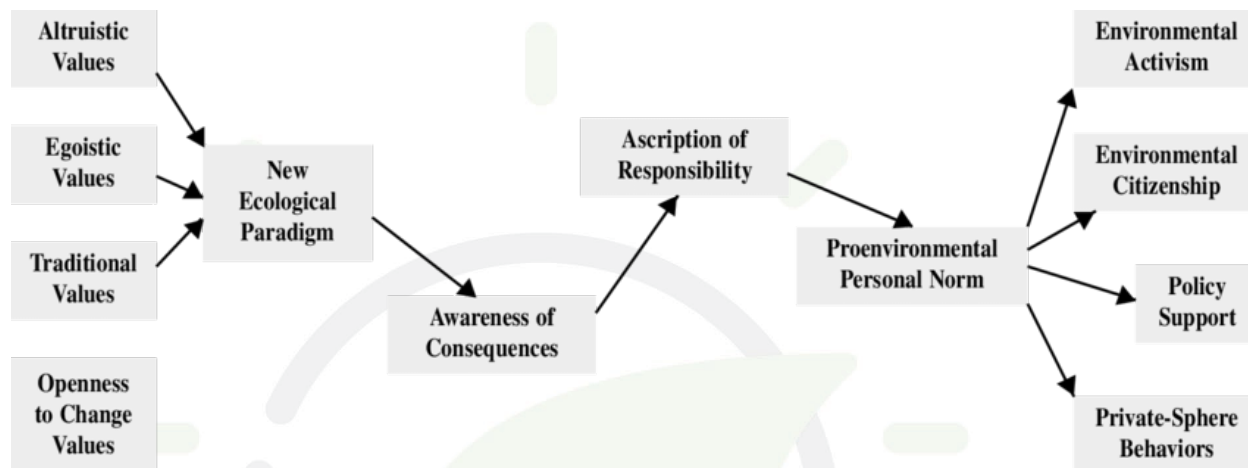
Figure 2. Schematic model of variables in the Value-Belief-Norm theory as applied to environmentalism, showing direct causal relationships between pairs of variables at adjacent causal levels.
Source: Stern (2000).

Finally, motivations play an important role as well. Stern's more recent work (e.g. Clayton et al. 2015P) shows that young people are very concerned by the issue of climate change, but they do not envision concrete solutions in which they could get involved. This literature distinguishes then between perceived usefulness (extrinsic motivation) and self-accomplishment (intrinsic motivation). Each of these two beliefs has finer components (see Fig. 3).
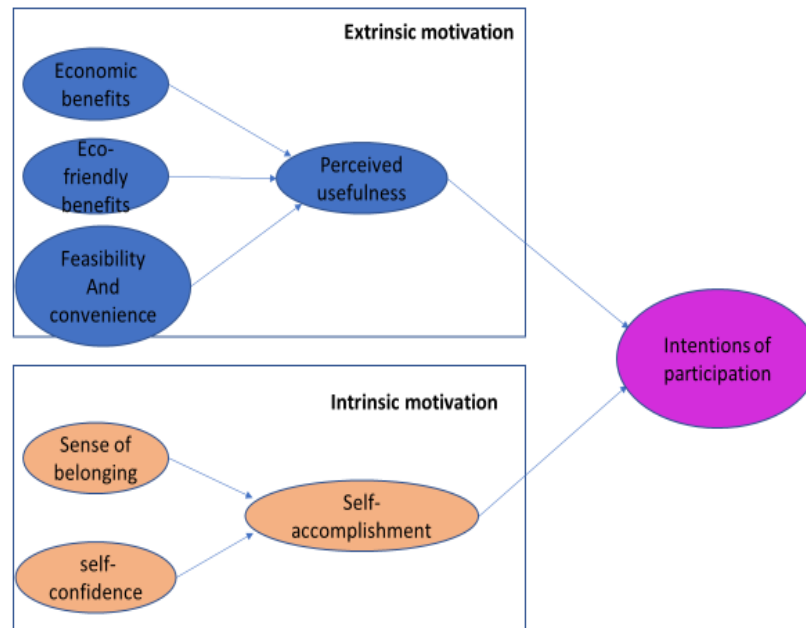
3. The role of motivational components in the context of experiential learning applied to entrepreneurship (adapted from Radu and Redien-Collot, 2013)

These different motivational components play a crucial role in Bell and Stellingwerf's (2012) value chain that guides a sustainable entrepreneurial process (see Fig. 4), as well as in the process of entrepreneurial learning highlighted by Cope (2003; 2011) and Pittaway and Thorpe (2012). According to those authors, in fact, two are the key dimensions in entrepreneurial learning: the double loop learning and the transformative learning. Within the double loop learning, individuals renew their understanding and redefine their entrepreneurial organizational processes. Within transformative learning, individuals manage to change their self-understanding in order to implement their potential pivots resulting from double loop learning.
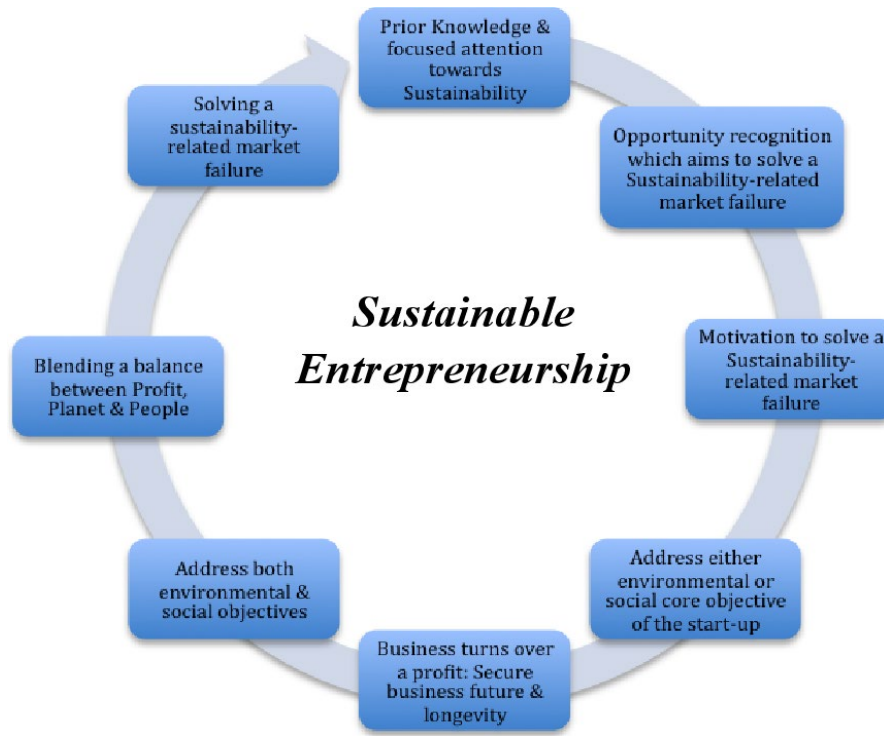
Figure 4. The different components of entrepreneurial motivation and development in sustainable entrepreneurship
Source: Bell and Stellingwerf (2012).

In order to foster transformative learning in students and to allow them to concretely and effectively engage in sustainable entrepreneurship, the EntRENEW needs analysis articulates the motivations and resistances of the participants, by focusing on their extrinsic and intrinsic motivations, as well as on the actual needs of entrepreneurial project carriers.

2.1.2. Focus groups for needs analysis

The exploratory focus groups have been conducted at 4 of the 5 academic institutions participating in the project. They have been conducted in the native language of the speakers and translated and transcribed in English afterwards. The questions explored the extrinsic motivations or perceptions of the respondents, as well as their expectations or intrinsic motivations.

The definition of the concepts explored in the interviews follow:
- Eco-friendly benefits. This term most commonly refers to products/services that contribute to green living or to practices that help preserve resources like water and energy. Eco-friendly products also prevent increasing air, water, and land pollution.
- Economic benefits. These are benefits that can be quantified in terms of money generated, such as net income, revenues, etc. They can also consist of money saved when discussing a policy to reduce costs. Economic benefits can be measured and used in business and policy decisions, and in market analyses.

- Energy transition. It refers to a profound structural change in the way energy is produced and consumed. It is one of the components of ecological transition.
- Entrepreneurial projects. An entrepreneurial project aims at changing practices and business models to create value.
- Climate activism. Forms of activism range from mandate building in the community (including writing letters to newspapers), petitioning elected officials, running or contributing to a political campaign, preferential patronage (or boycott) of businesses, and demonstrative forms of activism like rallies, street marches, strikes, sit-ins, etc.
- Sustainable entrepreneurship projects. Those are entrepreneurial projects applied to sustainable development.

Focus groups were conducted on two main samples: the student and the academic and expert samples. The student sample consisted of no more than 6 respondents —males and females— involved in Master's programmes —in both science and social sciences— and 2 students involved in climate activism or environmental issues. The academic and expert sample consisted of no more than 6 respondents —males and females— in both science and social sciences, familiar with entrepreneurial and/or environmental issues.

The questions asked in the focus group of students included 12 questions, while the questions for the focus group of academics and experts included 11 questions (see Annex I and II for questionnaires for students and academics and experts, respectively). Focus groups lasted in between 30 and 60 minutes.

The data analysis was based on the already cited interpretation grids from Stern (2000), Radu and Redien-Collot (2013), Bell and Stellingwerf (2012) and Cope (2003 and 2011).

Results of the focus groups at each academic institution are summarized in the Annexes III, IV, V, and VI.

2.2.   EntRENEW course's learning objectives

The overall aim of "enhancing students' entrepreneurial skills and competences in the renewable energy sector" is broken down into learning objectives within the fields of entrepreneurship and energy, considering the needs identified in the focus groups conducted at partner universities in the previous phase.

Here the learning objectives in terms of skills and competences to be acquired by students. After completing the course, students will be able to:

1. **LO1: Describe** the main aspects of institutional and regulatory frameworks of sustainability and how they are related to renewable energy.
2. **LO2: Apply** concepts, approaches, tools, and methods to identify, compare, and select innovative and sustainable business opportunities and models in the renewable energy sector.
3. **LO3: Characterize** sustainable business models that are applicable in renewable energy.
4. **LO4: Evaluate** business opportunities for business models in renewable energy market from meso, macro and micro perspectives.
5. *LO5: Propose* a sustainable business or financially viable organizational design concept for the (renewable) energy sector in a cross-sectoral / interdisciplinary setting.

These learning objectives will be elaborated in a more fine-grained detail during the project implementation. The achievement of the following learning objectives will empower students to become —at the end of the programme— successful entrepreneurs by strengthening their knowledge and ability to:

- Identify gaps in the sustainable energy market (and in the practices);
- Elaborate a business idea and a value proposition;
- Mobilize the political, societal, and business stakeholders in order to develop their project;
- Implement their business idea either in a start-up or an existing organization (private or NGO);
- Raise funds.

2.3.   EntRENEW course's pedagogical approach

In order to define an outline for the learning modules for the EntRENEW course, we started by detailing the pedagogical approach of the programme. Following the already mentioned literature on interests in and resistances to climate issues, the EntRENEW course will be based on experiential learning, that favors learning by doing, while engaging both participants' extrinsic and intrinsic motivations.

By considering Bloom's (1956) taxonomy of learning objectives ordered into hierarchal levels of complexity and specificity (see Figure 5), we then identified the six major cognitive activities and skills students will have to learn and perform throughout the entire programme, i.e. be able to:

a) Recall facts and basic concepts;
b) Explain ideas and concepts;
c) Use information in specific situations;
d) Draw connections among ideas and facts;
e) Justify a stand or decision;
f) Produce new or original work.
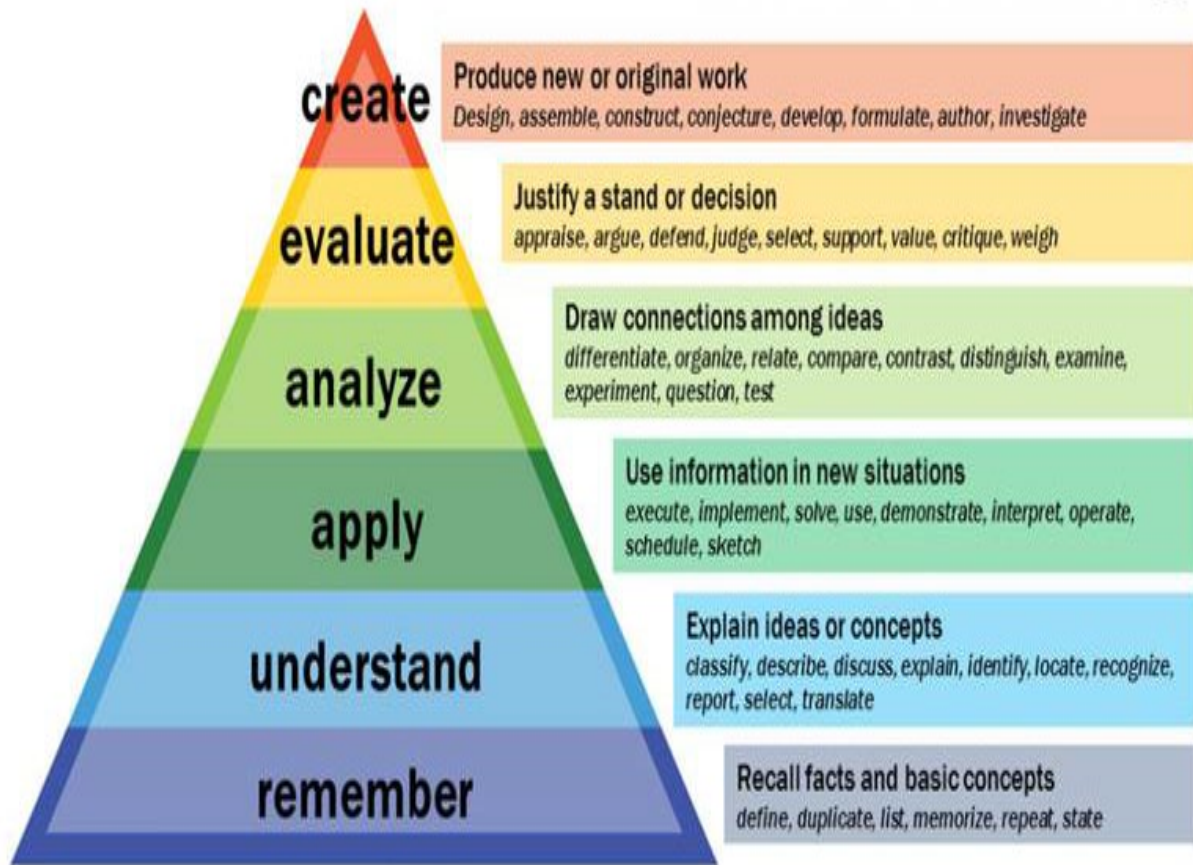
Figure 5: Bloom's taxonomy of cognitive learning objectives

We then considered the following thematic scope, as it emerged from the analyses performed in previous phases of the project:

a) *Knowledge and understanding*
   - Describe and understand methods and processes for business creation and renewal;
   - Explain how and why policy shapes the viability of renewable business.
b) *Skills and abilities*
   - Demonstrate skills needed for creating and launching a new business or product or service in renewable energy;
   - Evaluate the financial sustainability and risks of business models relevant in renewable energy, including products and services.
c) *Judgment and approach*
   - Develop an in-depth understanding of the dynamics and complexity in the interplay between the entrepreneur (founder/firm) and its entrepreneurial/innovation ecosystem (context).
d) *Innovation fields*
   - Life cycle assessment – on products developed by entrepreneurs from the universities;
   - Entrepreneurial skills related to climate impact.

By combining the abilities students will have to develop with the thematic scope of the EntRENEW programme, we outlined three different levels of acquired knowledge and skills: must-know, should-know, and nice-to-know. Results from this preliminary task are summarized in Figure 6.

Figure 6: Different levels of acquired knowledge and skills in the EntRENEW course

The EntRENEW course will then be an elective blended-learning course on *Entrepreneurship in Renewable Energy (ERE)* that will account for 5-7.5 ECTS —in between 130 and 187 hours of students'

work that can be distributed over 2-4 months. As a blended-learning course, the EntRENEW programme will integrate face-to-face sessions with e-learning, gamification elements, and a Virtual Incubation Hub. In-class training will have pre-class online preparations such as short videos.
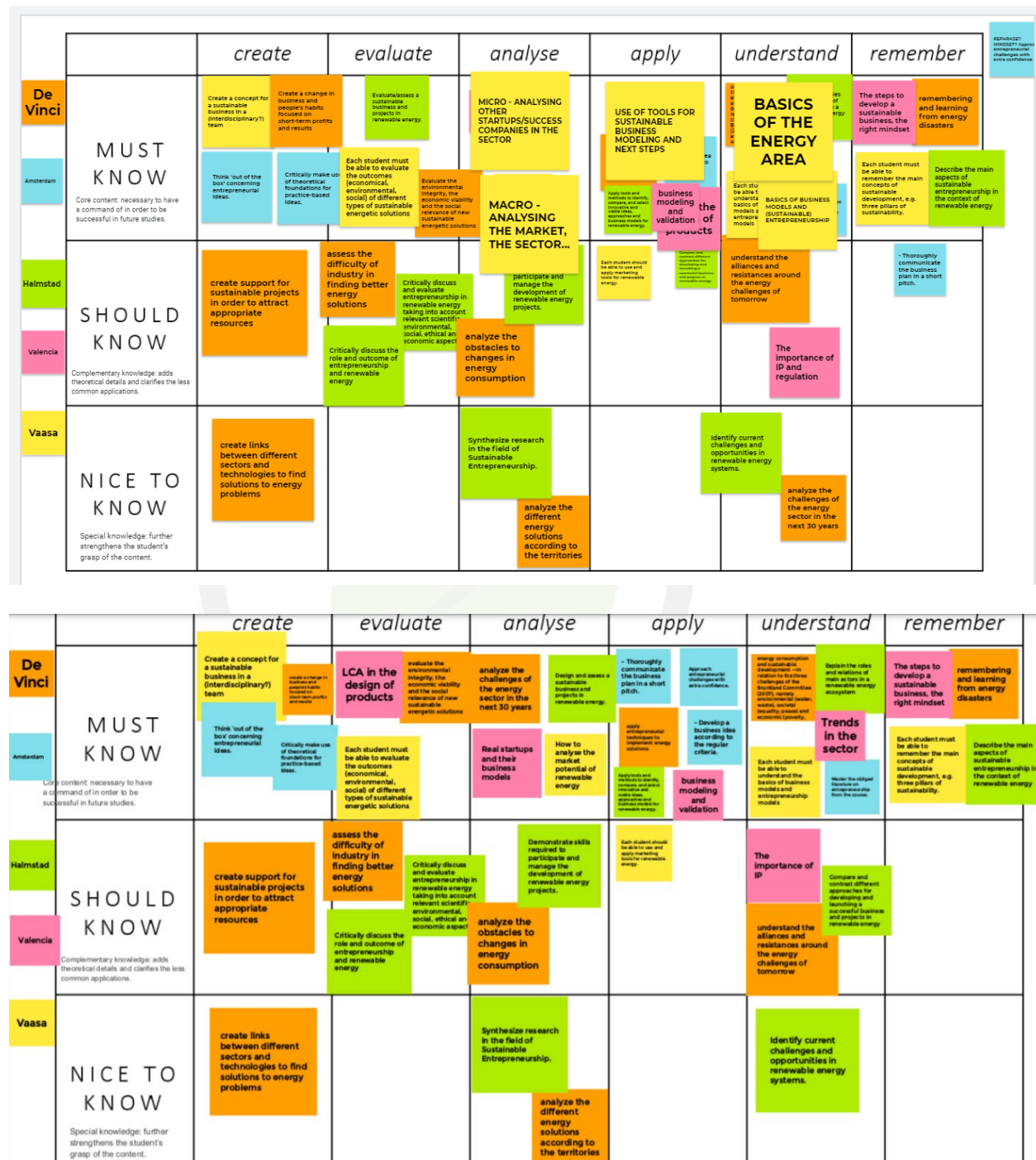
The course will ideally attract from 25 to 30 students on a yearly basis in each partner university. It will welcome students who (a) have ideally competed a bachelor programme, (b) have an interest in the energy transition, (c) belong to underrepresented categories in the fields of entrepreneurship and energy (e.g., women and minorities), and (d) come from different backgrounds: technical —to make them sound and grounded leaders— as well as managerial —to make them expert and competent on technical subjects.

As for the assessment approach, there would be either periodic or a mid-term assessment examining the outcomes. Possible outcomes would be a business idea and its prototype and a final assessment examining the business model and the business plan. Coaching would be offered by consortium partners professors with proven experience in these type of activities, supported by real mentors from incubators, start-ups accelerators, and Alumni members currently involved in the field of renewable energy and sustainable innovation, as well as private and public funding institutions which can be of enormous help for improving the chances of success of the projects developed by students enrolled in the EntRENEW course. There would be a blended examination as well, with an exam and with an assignment.

A special attention will be paid in the development of the e-learning platform (work package 3) and in the implementation phase to the specific rhythm and needs of students enrolled in actual programmes, as well as to the integration of the EntRENEW course in some of the existing MA programmes of partners' universities. Local adaptations will concern the type and duration of exercises, their frequency, the level of difficulty and the award methodology, including a deep analysis of extra credits opportunities within universities, and online learning compared to in-class session balance and complementarity.

2.4.   EntRENEW course's structure

The course will be structured in four different modules that will

1) introduce students to the main aspects of institutional and regulatory frameworks of sustainability in the specific field of renewable energy;
2) help them apply concepts, approaches, tools, and methods to identify, compare, and select innovative and sustainable business opportunities;
3) propose business models and organizational designs in the renewable energy sector that are both sustainable and financially viable; bring them to the market through their own startups.

The four modules will lead students through the following topics:
  -M1: Renewable energy systems
  -M2: Entrepreneurial ecosystems
  -M3: Business model innovation and ecosystems in renewable energy
  -M4: Launching successful start-ups

Figure 7 summarizes the content and the pedagogical approach of the four ENtRENEW course's modules.
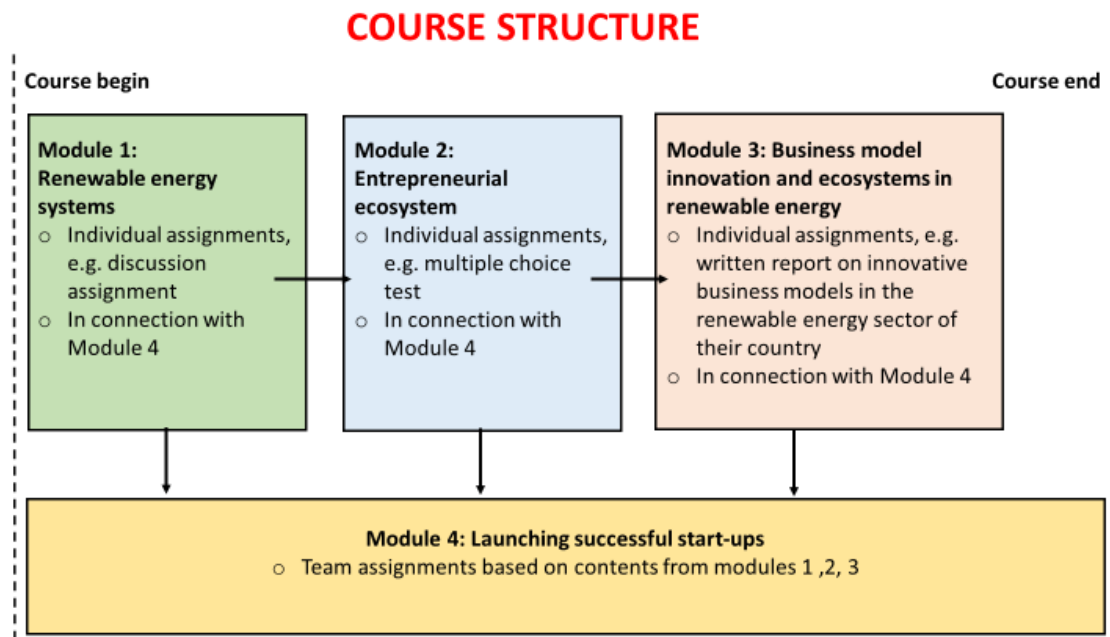
COURSE STRUCTURE

Figure 7. EntRENEW course's structure

2.5. EntRENEW course's content outline

2.5.1. Module 1 - Renewable energy systems

The module will introduce students to the basic general principles of renewable energy systems, and to the technical fundamentals of entrepreneurship in the field of renewable energy by offering a basic overview of renewable energy technologies.

Specifically, students will be introduced to:
1) the 2030 Agenda and to the concept of sustainability;
2) the evolution of energy technologies over the last 2 centuries, with a focus on
   a. National and international history
   b. Territorial specificities;
3) the evolution of energy policies and regulations, through the example of national applications of international policies in the EU;
4) The current regulation of energy management at two main levels:
   a. national regulation
   b. EU regulation.

This module will mainly contribute to two learning objectives —learning objective 1 and 4, i.e.:
- LO1: Describe the main aspects of institutional and regulatory frameworks of sustainability and how they are related to renewable energy;
- LO4: Propose a sustainable business and a financially viable organizational design concept for the (renewable) energy sector in a cross-sectoral / interdisciplinary setting.

2.5.2.   Module 2 - Entrepreneurial ecosystems

The module will introduce students to innovation and entrepreneurial ecosystems; the concept of sustainable entrepreneurship; life-cycle assessment and impact metrics; specific entrepreneurial competences; skills and sector-specific approaches to entrepreneurship; motivations to become an entrepreneur; and the principle of entrepreneurial marketing.

Specifically, the module will make students familiar with the concept that entrepreneurial ecosystems are the whole set of players and connections that are relevant for the development of entrepreneurship in a certain area, by focusing on:

1) Background on open innovation;
2) Vibrancy of an entrepreneurial ecosystem;
3) The funnel: pre-incubation; incubation; post-incubation;
4) Venture development: firm characteristics, entrepreneurial roles, finance formality;
5) Entrepreneurial development: motivation, competences, roles, behaviors;
6) Trends: energy; health, technology; agriculture; social;
7) Three important phenomena: university spin-offs; business Incubators; business accelerators.

This module will mainly contribute to two learning objectives —learning objective 1 and 2, i.e.:
- LO1: Describe the main aspects of institutional and regulatory frameworks of sustainability and how they are related to renewable energy;
- LO2: Apply concepts, approaches, tools, and methods to identify, compare, and select innovative and sustainable business opportunities and models in the renewable energy sector.

2.5.3.   Module 3 - Business model innovation and ecosystems in renewable energy

The module will introduce students to concepts such as business model innovations and ecosystems in renewable energy; the phenomenon of corporate entrepreneurship in the sector; risk management and energy system instruments; product prototyping and customer development; fast validation methodologies and minimum validation products in the specific sector of renewable energies.

Specifically, students will be introduced to:
1) Emerging business models and practices in sustainable entrepreneurship;
2) Business model as a source of innovation in renewable energy;
3) Ecosystem-based sustainable business models;

4) New business logics for firms and new ways to create, capture and deliver value for its stakeholders;
5) Barriers for developing business models.

This module will mainly contribute to three learning objectives —learning objective 2, 3, and 4 i.e.:
- LO2: Apply concepts, approaches, tools, and methods to identify, compare, and select innovative and sustainable business opportunities and models in the renewable energy sector;
- LO3: Characterize sustainable business models that are applicable in renewable energy;
- LO4: Propose a sustainable business and a financially viable organizational design concept for the (renewable) energy sector in a cross-sectoral / interdisciplinary setting.

2.5.4. Module 4 - Launching successful start-ups

The module will allow students to acquire practical tools to develop sustainable projects. They will learn how to implement innovative ideas and launch successful start-ups through tools and concepts of:

1) business model generation for successful start-up modelling;
2) validation techniques;
3) different funding schemes, approaches and options;
4) market trends and future challenges.

Students will do so by applying sustainable finance theory to real-life investment cases study from the EntRENEW ecosystem.

By having students apply all the knowledge acquired during the course, this module contributes to all learning objectives, i.e.:

- LO1: Describe the main aspects of institutional and regulatory frameworks of sustainability and how they are related to renewable energy;
- LO2: Apply concepts, approaches, tools and methods to identify, compare, and select innovative and sustainable business opportunities and models in the renewable energy sector.
- LO3: Characterize sustainable business models that are applicable in renewable energy.
- LO4: Evaluate business opportunities for business models in renewable energy market from meso, macro and micro perspectives.
  LO5: Propose a sustainable business and a financially viable organizational design concept for the (renewable) energy sector in a cross-sectoral / interdisciplinary setting.

2.6. EntRENEW course and learning objectives: External validation

Three external experts constituting the EntRENEW Advisory board are asked to provide an independent expert feedback at key moments of the project:

1) pedagogical methodology and content design;
2) contents development;
3) post-demo validation of the final EntRENEW course.

Therefore, after finalizing the first phase of the project, i.e., developing the EntRENEW course' pedagogical methodology and content, we asked an expert in the field of entrepreneurship and innovation in renewable energy to assess and validate our work, before proceeding to the next phases of content development and implementation.

Gaël Le Boulch, responsible of the open innovation at EDF (Électricité de France S.A., literally Electricity of France, a French multinational electric utility company, headquartered in Paris, and operating in Europe, South America, North America, Asia, the Middle East, and Africa), assessed the EntRENEW course' structure and modules, as well as the articulation between contents and outcomes. His full assessment is reported in Annex VII.

3. References

Bell, J., & Stellingwerf, J. (2012). Sustainable entrepreneurship: The motivations and challenges of sustainable entrepreneurs in the renewable energy industry.

Bloom, B. S. (1956). Taxonomy of educational objectives. Vol. 1: Cognitive domain. New York: McKay, 20(24), 1.

Clayton, S., Devine-Wright, P., Stern, P. C., Whitmarsh, L., Carrico, A., Steg, L., & Bonnes, M. (2015). Psychological research and global climate change. Nature climate change, 5(7), 640-646.

Cope, J. (2003). Entrepreneurial learning and critical reflection: Discontinuous events as triggers for 'higher-level' learning. Management learning, 34(4), 429-450.

Cope, J. (2011). Entrepreneurial learning from failure: An interpretative phenomenological analysis. Journal of business venturing, 26(6), 604-623.

European Social Survey (2016). Round 8. Available at:
https://www.europeansocialsurvey.org/data/download.html?r=8

European Social Survey (2018). Round 9. Available at:
https://www.europeansocialsurvey.org/data/download.html?r=9

European Social Survey (2018). European Attitudes to Climate Change and Energy. Available at:
https://www.europeansocialsurvey.org/docs/findings/ESS8_toplines_issue_9_climatechange.pdf

Pittaway, L., & Thorpe, R. (2012). A framework for entrepreneurial learning: A tribute to Jason Cope. Entrepreneurship & Regional Development, 24(9-10), 837-859.

Poortinga, W., Spence, A., Whitmarsh, L., Capstick, S., & Pidgeon, N. F. (2011). Uncertain climate: An investigation into public scepticism about anthropogenic climate change. Global environmental change, 21(3), 1015-1024.

Radu Lefebvre, M., & Redien-Collot, R. (2013). "How to do things with words": The discursive dimension of experiential learning in entrepreneurial mentoring dyads. Journal of Small Business Management, 51(3), 370-393.

Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. Journal of Social Issues, 56, 407–424.

4. Annexes

4.1. Annex I - Questionnaire for students

Perceptions	1. Why would you join a programme about sustainable entrepreneurship focused on energy transition? 2. And why not?
Eco-friendly benefits	3. What eco-friendly benefits would you identify in a programme about Sustainable Entrepreneurship? For yourself? 4. What components of the programme would make it useful from an environmental point of view?
Economic benefits	5. If you were to participate in this programme, what would be the economic benefits for you? 6. Any suggestion?
Feasibility & convenience	7. What entrepreneurial projects could you develop in a six-month period? 8. What would be the most satisfying aspects in the development of entrepreneurial projects in the field of energy transition?
Expectations	9. What would you personally expect from a programme about sustainable entrepreneurship focused on energy transition?
Sense of belonging	10. Would such a programme make you feel more legitimate in the field of climate activism? If so, how? 11. What goals would you have for your community?

Self-confidence	12. What would help you gain self-confidence and become more effective in developing sustainable entrepreneurship projects?
	    a) Within a sustainable entrepreneurship programme focused on energy transition;
	    b) Outside such a programme.

4.2 Annex II - Questionnaire for academics and experts

Perceptions	1. Why would students join a programme about sustainable entrepreneurship focused on energy transition?
Eco-friendly benefits	2. What eco-friendly benefits would you see for them? 3. What components of the programme would make it useful from an environmental point of view?
Economic benefits	4. If your students were to participate in this programme, what would be their economic benefits? 5. Any suggestion?
Feasibility & convenience	6. What type of entrepreneurial projects could your students develop in a six-month period? 7. What would be the most satisfying aspects in the development of entrepreneurial projects for them?
Expectations	8. What would your students personally expect from a programme about sustainable entrepreneurship focused on energy transition?
Sense of belonging	9. Would such a programme make your students feel more legitimate in the field of climate activism? If so, how? 10. What goals would your students have for their community?
Self-confidence	11. What would help your students gain self-confidence and become more effective in developing sustainable entrepreneurship projects?

4.3. Annex III - Focus groups at ALDV

Results from the two focus groups conducted at ALDV highlighted the following.

A. Students' motivations

a) Two types of students' motivations:
- students primarily interested in entrepreneurship and then in the impact of the opportunity and/or the company
- students primarily interested in sustainable development who see entrepreneurship as a form of activism

b) The place of students in energy entrepreneurship?
- A highly regulated sector where the costs of research and development require significant capital and the support or even partnership of a very large company
- Successful entrepreneurs in this sector are seasoned professionals who have worked for a very large company, have a powerful network, and have a management background (see the example of Equateur)
- Energy industry seems to promote mature entrepreneurship rather than student entrepreneurship.

B. Academic staff and students' recommendations

a) It's important that teachers show some commitment. It is important that they are aware and informed.

b) The educational team of the programme need specialists and generalists: contextualization is important

c) The programme should have a clear international dimension: international and more importantly trans-regional approaches help
- to understand the different impacts of the energy industry on the globe
- to explore varied initiatives that reflect the contingencies (and the respect of) of specific economic, social, cultural contexts

d) At the end of the programme, participants should have a portfolio of ideas and projects in the field of energy transition and beyond. It would be interesting to set up an online idea book that would follow the students throughout their studies and beyond (a challenge for the Alumni)

e) During the programme, students should learn to structure their network in the domain of sustainable development.

C. The programme components

a) Prerequisites
To join an entrepreneurship programme in the Master's programme,
- Students should have a generalist background in sustainability and CSR in their Bachelor's degree (internships in impact firms or in a public agency)

- During the first part of their Master's programme, they should have clarified the links between their major area of study and issues related to the climate transition.
- By participating in association activities that highlight the challenges of the climate transition, candidates have a clear knowledge of all the forms that the fight for a world in better condition and a more responsible society takes today.

b) Content and learning objectives

- It is important to launch the Master programme in Energy Entrepreneurship with a bootcamp where students discover and explore the different available technologies and innovations in the field of energy
- Opening the scope of students' interest beyond energy technology: Understanding of the different nuances of climate activism; strong knowledge of circular economy; cases on territories destroyed by traditional fossil energy extraction (and possible remediation)
- An open-up approach to entrepreneurship that allows the development of a central project and several other initiatives on the themes of energy and sustainable development
- A typology of the different green recent business and non-profit initiatives around the world and/or in the EU.

D. Students' professional and economic benefits

a) As perceived by students
- A programme that must develop students' strong expertise in energy efficiency addressing large firms', individuals, and network members' energetic behaviors and preferences
- Possible career development:
    - Entrepreneurs
    - Corporate experts/ developers of intrapreneurial projects in stainable development
    - NGOs founders and developers
    - Ability to continuously update knowledge and practices in the energy field

b) As perceived by both students and academic staff
- Development of students' self-confidence
    - Participants must learn how to advice and criticize their peers
    - Participants must shadow project leaders in energy sector
    - Participants present their projects in networks and associations
    - Participants join important national and international association dedicated to climate activism
    - Participants must learn to develop a business while remaining Zen (see Amarok observatory that studies entrepreneurs' health state and stress).

E. The nature of entrepreneurial projects

c) Feasible projects
  - Energy efficiency
  - Supply of materials
  - Energy autonomy
  - Low Tech projects
d) Challenging projects
  - Production of renewable energy.

F. Students' personal expectations

- This programme must open the themes on the question of sustainability, the energetically responsible city, the energetically autonomous countryside but also considered as underdeveloped.
- The programme should help participant to understand and resituate the changes consumption with other changes in life choices, lifestyles
- The programme should show how to articulate regulation, technology, and entrepreneurship to change consumption in understanding the side-effect of present virtuous decisions
- Beware of the leaders of the sector: they are benchmarks to measure what still needs to be changed
- Welcome to true energy leaders who are aware of the full impact of present green innovation.

G. Academic staff's expectations

- Connect energy issue with the different environmental issues
- Develop constructive articulation of high tech and low-tech dimensions
- Meet people similarly concerned with environmental issues
- Experience a complete approach of entrepreneurship.

H. Directions to design the EntRENEW course

Figure 8 summarizes the results of the two focus groups at ALDV.

Prequisites	Contents	Projects	Career opportunities

A generalist background in sustainability and CSR

Clarification of the links between their major area of study and issues related to the climate transition Memberships in 'eco-activitist associations

A program clearly situated in the field of sustainable development and sustainable entrepreneurship the question of energy transition must be constantly resituated at least in relation to the three challenges of the Bruntland Committee (2007), namely environmental (water; waste), societal (equality; peace) and economic (poverty, unemployment) challenges

❑ Energy efficiency
❑ Supply of materials
❑ Energy autonomy
❑ Low Tech projects

Entrepreneurs

Intrapreneurs & Consultants

NGO founders & Developers

articulate regulation, technology and entrepreneurship

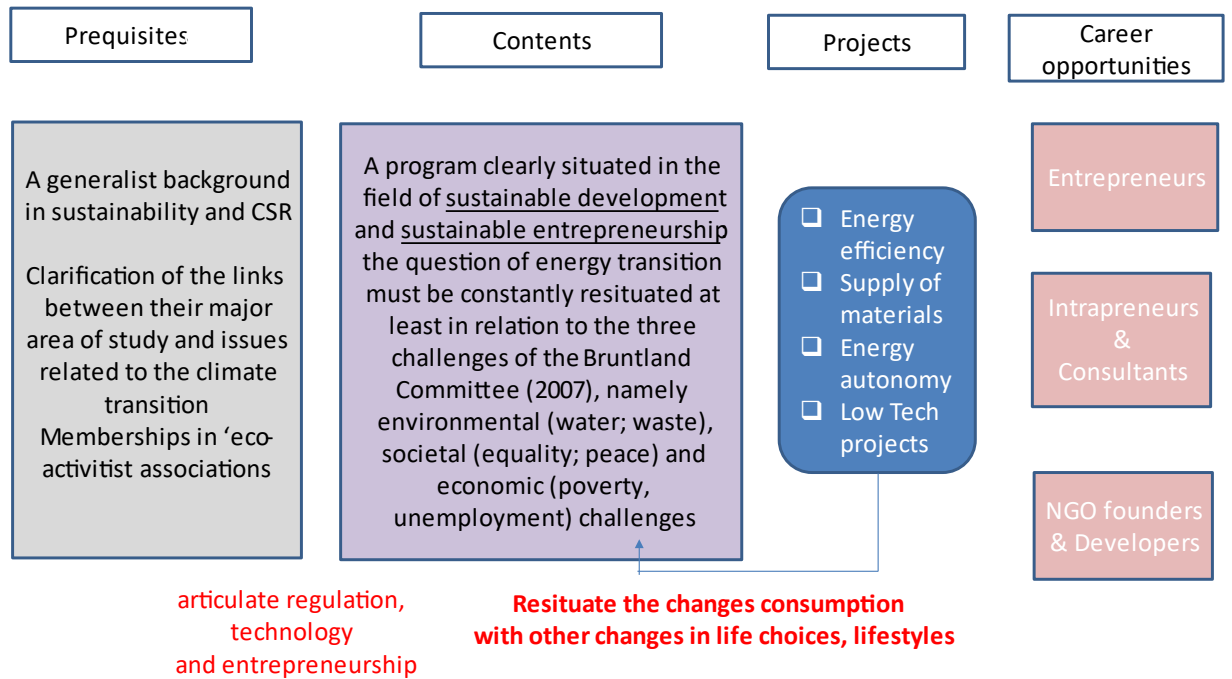**Resituate the changes consumption with other changes in life choices, lifestyles**

Figure 8: Directions to design the EntRENEW course, as resulted from the two focus groups conducted among students and academic staff.

4.4. Annex IV – Focus groups at Halmstad University (HU)

4.4.1 Focus group with students

The focus group with students at HU was conducted on February 4, 2021. Table 1 describes the respondent's sample.

Table 1 – Information about the participants (students)

Resp.	Current Position	Gender	Age	Nationality	Background
#	Students				
1	Student in the Master's programme in Industrial Management and Innovation	Male	26	Swedish	Mechanical Engineering
2	Student in the Master's programme in Industrial Management and Innovation	Female	25	Swedish	Product Development and Innovation
3	Student in the Master's programme in Industrial Management and Innovation	Male	24	Swedish	Management and Logistics
4	Student in the Master's programme in Industrial Management and Innovation	Female	24	German	Business Administration and Engineering
5	Student in the Master's programme in Industrial Management and Innovation	Female	30	Swedish	Development Engineering

Perceptions

1. Why would you join a programme about sustainable entrepreneurship focused on energy transition?
Students agree that a programme in Sustainable Entrepreneurship in the Renewable Energy sector is necessary and some of them would take as a complementary education, but not as the first choice. Besides, students would like to have two courses (one in the basic and one in the advanced level) in the programmes they belong, instead of a full programme.

2. *And why not?*
Students may not feel interested in Entrepreneurship, since this sounds like a programme designed for people who want to own a company. Maybe the "Sustainable Entrepreneurship" part could be shown in the last part of the programme's title. Also, entrepreneurship could be replaced by "leadership". Yet, students are concerned about what background is required to join the programme.

Eco-friendly benefits

3. What eco-friendly benefits would you identify in a programme about Sustainable Entrepreneurship? For yourself?
Understanding how to better manage companies to respect and protect the environment.
Preparing future leaders to be more conscious about the need of incorporating sustainability in the companies' mentality.
Acquiring knowledge on how to implement new products and services that are environmental-friendly, sustainable and profitable.

4. What components of the programme would make it really useful from an environmental point of view?
Learning how to act as entrepreneurs to develop and implement environmental-friendly production systems, with less consumption of natural resources, less aggression to the environment and less waste. In addition, we can include questions about how to reuse resources and how to develop alternative energy sources that are less harmful to the environment.
Learning how to engage the society and the government in projects that help to preserve natural resources.

Economic benefits
5. If you were to participate in this programme, what would be the economic benefits for you?
Students think they would develop the skills, abilities and knowledge needed as managers or independent consultants for leading companies in energy transition projects. Joining this programme would give them a competitive advantage when looking for jobs, especially in big companies.

6. Any suggestion?
The programme could provide a multidisciplinary perspective, including how to apply sustainable projects about renewable energy in multiple industries and how sustainable entrepreneurs can engage people with different backgrounds and expertise in such projects.
Offering scholarships and/or prizes for good projects.

Feasibility and convenience
7. What entrepreneurial projects could you develop in a six-month period?
Students argue that 6 months is a short period. But they could be able to design/project a startup, create or test a new product or process to reduce the resource consumption in product fabrication, and study the feasibility of new production processes and systems. Creating alternatives for reusing resources (e.g., waste).

8. What would be the most satisfying aspects in the development of entrepreneurial projects in the field of energy transition?
Achieving profitability by consuming less resources, but with efficiency and responsibility.
Changing people's mindset about sustainability.
Promoting good impact in the community, i.e., being recognized as sustainable entrepreneurs with relevant projects.

Expectations
9. What would you personally expect from a programme about sustainable entrepreneurship focused on energy transition?
Students think that the programme should be created in collaboration with companies. They will feel attracted by the programme if they see the opportunity to join an internship in a company during or after the programme.
Students expect to acquire specific knowledge in project management in renewable energy, leadership, circular economy, alternative energy sources and resources consumption. Students would also like to have practical courses, including working with challenges from real cases.
Students expect to understand the sustainable entrepreneurship from an ecosystem perspective and how they could develop projects that create positive impact in the ecosystem, e.g., from the re-use of resources.

4.4.2 Focus group with academics

The focus group with academics was conducted on February 17, 2021. It included 6 people (full professors, associate professors, and PhD students), 2 males and 4 females, in between 35 and 58 years old, proceeding from 4 different countries, with different expertise (business administration, innovation science, and environmental science), and different backgrounds (sustainability, environmental technology and impact).

Programme Identity

1. *In your opinion, why would students join a programme about sustainable entrepreneurship focused on energy transition?*

It is related to the value system they want to pursue in terms of how they want to create the world to live in the future. Of course, there is a professional background knowledge that maybe they want to change or to apply practically in an entrepreneurial project the knowledge they had previously from other programmes that are not necessarily aligned with entrepreneurship, but I also think that there is a lot that agencies are speaking.

There are agencies speaking about energy transitions as mechanisms to achieve the SDG in terms of energy production in the traditional sense, but in electrical vehicles and so on. This has been lifted in a public space globally, a lot, but this is an opportunity for self-employment, for these students if we go with these students towards a more pragmatic perspective from the idealistic vision. Then, it is an interesting combination work in an application area like energy systems.

Design of the Programme

2. *If your students were to participate in this programme, what eco-friendly benefits would you see for them?*
3. *What components of the programme would make it useful from an environmental point of view?*
4. *If your students were to participate in this programme, what would be their economic benefits?*
5. *Any suggestion?*

Give the students not only the western world problematics, but also the view of based of the pyramid (BOP) organizations, because sometimes I have the feeling that we still relate to the western world problems and I think BOP innovations I would like for them to have a larger part because there are many things to do there, especially when it comes to energy, food cooking, etc. in different countries.

Students will learn a lot together with the entrepreneurship aspect, they will have good results when they start innovating in eco-friendly benefits, developing their own ideas, if they have in the programme courses in ecology, circular economy, climate issues, they will have lots of benefits using their entrepreneurial skills.

It would be expected that this programme teaches students how to think at the same time in environmentally, eco-friendly, economic, and even social perspectives. In the way the programme is addressed now considering energy transitions, there are many social aspects involved, not only in economic or environmental issues. What will be interesting in the system thinking and how to work to mitigate unintended consequences in the future. Sometimes, when you start with good intentions your idea or your project to change the world, but if you do not consider the system when you develop your idea, it might turn out that in the long term you cause an intended consequence that you did not have thought before about the eco-friendly benefits. It is difficult to have the perfect good idea or product that won´t have a negative impact from a sustainable point of view and it is important to identify the risks in this matter from the beginning.

Students want to see themselves in the future. Will the programme give them benefits for jobs in the industry or academic sector? Make students aware of the new opportunities they can open in this field like entrepreneurial activities, trends about the future problems to give them a scenario for using creativity to solve new problems. The programme should consider the situation or how the world will look like after the student ends the programme.

Leadership and experience-based learning should be included, these components should be there, because that is developing the students´ new ways to think during the learning process or during the programme. One thing that should be promoted is active listening, even though these aspects are not obvious, but they are implicit in the work of the students in communication and building networks activities.

Entrepreneurial Projects

6. *What type of entrepreneurial projects could your students develop in a six-month period?*
7. *What would be the most satisfying aspects in the development of entrepreneurial projects for them?*

The risk of a programme which elaborates on sustainable energy transitions are global issues, long term, open ended. The challenge is to come down to the practicalities about what we can do as individual humans, as entrepreneurs or any role we will play within the time frame and the budget.

The programme needs to think about a very open design of the programme and more detailed design during these six months depending on what kind of project and/or entrepreneur/student we will have in the programme. If these students, for example, are more interested in market questions then, it must be an openness in the programme that he/she can use his/her skills to do that. If it is product development or policy implication questions. We need to deal with the student`s motivation.

Focus: Energy Transition

8. *What would your students personally expect from a programme about sustainable entrepreneurship focused on energy transition?*

No matter the programme there are some generic expectations, like content, real projects, these can be their own projects or projects from companies or other organizations about the subject that allow them to build the network, collaboration with other institutions, then they can meet other students and seeing that their ideas and solutions are implemented in some way and having impact.

It will be necessary to use different pedagogical approaches like experience learning, interdisciplinary collaboration, everything that makes the programme alive and relevant.

9. *Would such a programme make your students feel more legitimate in the field of climate activism? If so, how?*

Students that will apply for this type of programme will have this enthusiasm to contribute to have a better world. It would be good to see another word in this topic, proactive – climate work instead of climate activism, it means the process is more action oriented. It is always good to have students that know to back up their engagement and they are more legitimate working with the climate issues because they have a lot of knowledge behind them.

it is desirable to have students that have already entrepreneurial experiences then they can develop their profile toward the sustainability area. This is a different scenario if we have students that want to become entrepreneurs. The experienced ones in entrepreneurship might need feedback, monitoring, new ideas and tools to develop their venture. If they want to learn the knowledge from the beginning, then we must teach them about entrepreneurship and sustainability. I connect this with what Fawzi said, about having students that already develop their own ideas.

Put effort into having knowledge about crisis leadership and crisis management and safety leadership, this knowledge might make students feel more confident working with the topics.

Thinking of an entrepreneur as a problem solver, it is quite important because what we see in climate activism is the blaming of politicians, middle aged white male men. What we teach in entrepreneurship and innovation goes back to ideas suggested by Schumpeter and others, that is what drives societal movements, then it is more like a bottom-up way of thinking about changing society which empowers the ones with happy energies to change, hopefully, our students will follow this path. This programme will result in empowerment in a way forward for them to wreck the energy to something constructive.

Practical Role in the Society
10. *What goals would your students have for their community?*
11. *What would help your students gain self-confidence and become more effective in developing sustainable entrepreneurship projects?*

It will be nice to include in the programme the different situations an entrepreneur has to face. Make students confront a situation and learn how to handle it, then the confidence will be gradually developed. Using their expertise in the solutions and making them aware about their own skills is a way to promote this confidence. Students can see how their knowledge was relevant to solve a problem. Consider the situation of students that come from developing countries in which there are limited resources to achieve some solutions that they learn in our programme. It is important that we define tools for different kinds of contexts in order to provide relevant content for the students.
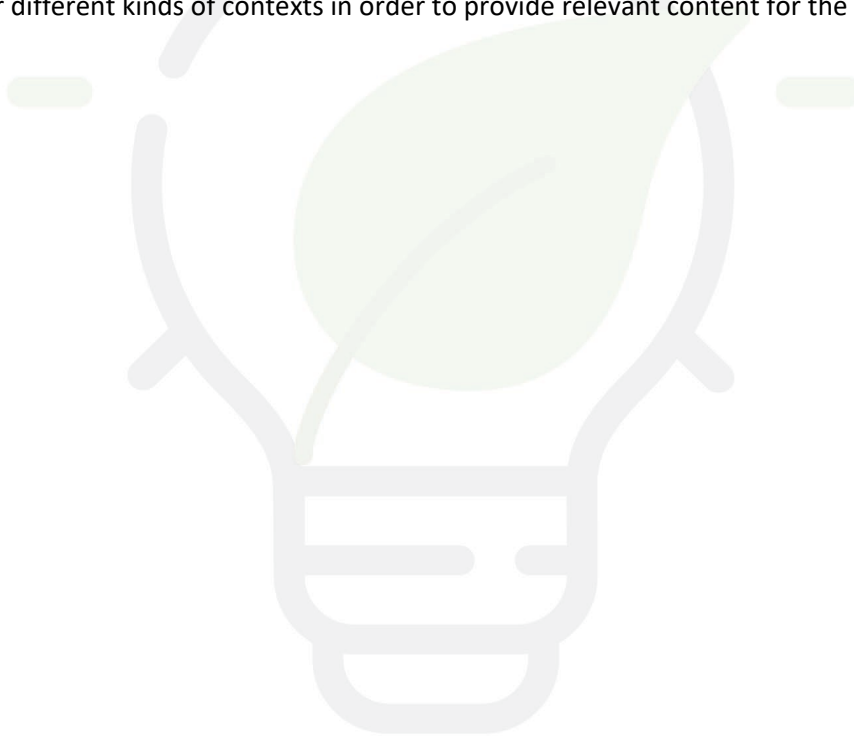
4.5. Annex V - Focus groups at University of Vaasa (UVA)

4.5.1. Focus group with students

Two focus groups with in total five participants were carried out. The focus groups were conducted online via Zoom on 9.3.2021 and 19.3.2021.

Table 2 – Information about the participants (students)

Current Position	Gender	Nationality
2 master-level students from the School of Technology and Innovations 4.5.	Male	Finnish
2 master-level students from the School of Marketing and Communication	Female	Finnish
1 non-Finnish master-level student from the School of Technology and Innovations	Male	

Programme Identity
1. *Why would you join a programme about sustainable entrepreneurship focused on energy transition?*
2. *And why not?*

A programme offering student entrepreneurship knowledge and skills is as such already interesting. Combining it with the globally very important and urgent topic of sustainability and energy transition was seen as fascinating. Thus, gaining knowledge, skills, and expertise within both areas is as such interesting, and the combination of them is even better. In addition, a very big market is linked to these topics, which makes it very interesting for students, since it opens a lot of different opportunities. One of them being to create an own company, but also regarding other future job opportunities, e.g., within the Vaasa regions energy cluster Energy Vaasa. The student's personal interest in sustainability issues is also relevant as a motivation factor.

The only challenges or negative sides could be that it does not timewise fit into your study schedule or that there would be some negative rumors about the programme, if e.g., some students would have experienced that the programme was in theory interesting, but not well implemented or did not meet the expectations of the participants.

Design of the Programme
3. *What eco-friendly benefits would you see? For yourself?*
4. *What components of the programme would make it useful from an environmental point of view?*
5. *If you were to participate in this programme, what would be the economic benefits for you?*
6. *Any suggestion?*

The participants raised eco-friendly benefits in the scale of society or communities and related to their own life. Educating students getting skills to carry out entrepreneurial work in this field will contribute on a more general societal level, since they will be able to work with energy related tasks from an entrepreneurial point of view in their communities. In addition, the aspect was raised that it could help students to create something that will help the environment locally, nationally, or globally. Gaining more knowledge and learning new skills will on an individual level enable the student to apply them in their

personal lives. They will know how to live more sustainably and how to apply different tools in their daily lives. At the same time, they will be able to tell others and spread the word about what they have learned.

The components / aspects raised, which would be useful (not only from an environmental point of view) were:
- A stronger focus on practice/applying than on theory
- Getting in touch with real companies / helping companies to solve problems they have in real life
- Field trips or visits to different companies
- Having the chance to create, at least on paper, a business within the field
- The value chain and the process behind it (value chain management)
- The impact of energy production
- Interpretation of available data
- Carbon footprint, water footprint etc.

The economic benefits mentioned by the participants were getting a stronger basis to start an own company, which then would give you economic benefits. However, also the risks related to entrepreneurship should be covered. The programme would also provide students, which do not want to start their own company, with knowledge and skills needed to work in an already existing company. With this kind of knowledge, the students will be appreciated by companies in the market in general. It will help them to stand out and to get a position or could help you to get involved in new projects when you are already working in a company. The collaboration with companies could open possibilities for partnerships in future.

Getting a certification from an international organization would be very valuable for the participants, since this kind of certifications are typically good to include in resumes when applying for positions.

Entrepreneurial Projects
7. *What projects could you develop in a six-month period?*
8. *What would be the most satisfying aspects in the development of entrepreneurial projects?*

A six-month period was seen as a long time by some of the participants, others stressed that it is quite a limited time. A holistic approach was stressed, but also the possibility to choose the field of expertise to work into based on future aspirations. Suggestions for typical projects and satisfying aspects in the development included:
- working with a (mentor) company providing projects/ real cases to work on
- working in teams (~4-5 persons)
- establishing a company via simulation / in a case scenario
- projects including the business case, the business modelling, the customer reviews, and the technical solution
- projects increasing awareness among citizens
- plan a business concept, present the plan, and get feedback from entrepreneurs/mentors from the field, i.e., getting an evaluation from experts

Focus: Energy Transition
9. *What would you personally expect from a programme about sustainable entrepreneurship focused on energy transition?*
10. *Would such a programme make you feel more legitimate in the field of climate activism? If so, how?*

In addition to the aspects raised earlier networking, i.e., meeting new people and connecting with partners, which can give the students future possibilities, was raised as a strong expectation. The students saw the possibility to feel more legitimate because of the knowledge gained. It would make them more confident to talk about the topics, and with more knowledge the students would have the possibilities to do something and to spread the word and educate people around. Climate activism was not seen as a good aim of the course, but rather awareness raising among participants. The word "influencer" was suggested, "influencing others" was seen as a better formulation than climate activism for the programme context.

Practical Role in the Society
11. *What goals would you have for your community?*
12. *What would help you gain self-confidence and become more effective in developing sustainable entrepreneurship projects?*
   a) Within a programme about sustainable entrepreneurship focused on energy transition
   b) Outside such a programme

The discussion in this part was rather repeating the aspects brought up earlier. In addition, it was stressed that it would be important to work with communities, which are less aware of the problems and solutions, and to encourage them to the change of habits. Bringing the life-long learning perspective in and opening the programme also for non-regular students was seen as an opportunity to get larger groups to participate in the programme.

4.5.2. Focus group with academics

Three focus groups with in total six participants were carried out. The focus groups were conducted online via Zoom on 23.2.2021, 9.3.2021 and 12.3.2021.

General background information:
- Focus group 1: 1 non-Finnish male staff member from the School of Technology and Innovations
- Focus group 2: 1 non-Finnish female staff member from the School of Technology and Innovations, 2 non-Finnish male staff members from University of Vaasa
- Focus group 3: 2 non-Finnish female staff members from the School of Marketing and Communication

Programme Identity
1. *In your opinion, why would students join a programme about sustainable entrepreneurship focused on energy transition?*

The topics are very interesting and booming right now. Climate change is a business opportunity. The motivation could be to join in order to be able to start an own company or to get a position in an already existing company. With this kind of knowledge, the students would have better chances to get employed after graduation. Thiswould probably be appealing to someone, who would like to make an impact, with a drive to help the society and to make things better, and for students with a personal interest in sustainability related matters. In the future, there will be strong demand for entrepreneur-driven people being able to take a holistic approach and being able to understand an ecosystem perspective.

Design of the Programme
2. *If your students were to participate in this programme, what eco-friendly benefits would you see for them?*

3. *What components of the programme would make it useful from an environmental point of view?*
4. *If your students were to participate in this programme, what would be their economic benefits?*
5. *Any suggestion?*

Regarding eco-friendly benefits, there is a need in society to change our behavior drastically and continuously towards a more sustainable direction from an environmental point of view. This programme could help the students to identify the key mitigating factors for this. Environmental improvements on a general societal level (cleaner air, cleaner water) will also be a benefit for all citizens. On an individual level, the students would get an increased understanding in terms of carbon footprint, which they can apply in their own daily lives. In addition to components raised in the students' discussions, the importance to introduce tools to evaluate ideas from the sustainability and environmental perspective (taking the whole value chain into account) was stressed by the staff members.

Regarding economic benefits, students probably would not expect any short-term economic benefits. If some company would collaborate with the programme, it could sponsor something for the participating students. However, they would probably expect a long-term economic benefit via the possibilities to be employed in the field. A lot of the funding mechanisms is going into sustainable projects, it is therefore a clear benefit to be active in the field of energy transition now and in future. Every corporate in the world has sustainability targets nowadays, and this kind of knowledge is needed on the job market. This kind of programme could strengthen the participants CVs for a new more modern type of non-traditional jobs, where it can be challenging to find people with the right qualifications. In addition, there are long-term economic benefits on a societal level via environmental improvements, since they improve the well-being of citizens (cleaner air, cleaner water), which means less costs in medical care. On an individual level, an increased awareness is also saving money, since a more sustainable lifestyle meaning e.g., less consumption means saving money. For entrepreneurs bringing new cleaner technologies into the market, it can mean, on the short-term, investing a lot of money, which, in a long-term perspective, will be a sustainable business both from an economical and an environmental point of view.

Entrepreneurial Projects
6. *What type of entrepreneurial projects could your students develop in a six-month period?*
7. *What would be the most satisfying aspects in the development of entrepreneurial projects for them?*

Among the staff members, suggestions for typical projects were:
- identifying potential (technology) opportunities (also e.g., from the consumer's point of view)
- benchmark technological alternatives
- literature reviews
- case studies
- simulations or strategic games
- designing a framework
- developing a sustainable supply chain ecosystem
- market analyses, customer analyses, competitor analyses leading to a proof of concept (creation of a business plan)
- investigate how case companies could adapt to the societal changes

Satisfying aspects in the development included:
- to develop something; to come up with something, see it grow and materialize over time, see that others are interested in it, and see that it can have an impact
- to work together in a cross-disciplinary team

- the set out a clear path for the future and get a picture of in which field they want to develop themselves
- realize that their voice can be heard and that they can influence things, this is important since the current student will be working as leaders in 10 to 20 years
- get support and feedback from mentors/experts

Focus: Energy Transition

8. *What would your students personally expect from a programme about sustainable entrepreneurship focused on energy transition?*
9. *Would such a programme make your students feel more legitimate in the field of climate activism? If so, how?*

It was stressed by the staff members that different students will have different expectations. Some of the participants will get a good employment in the field, some participants would like to gain kills to have their own start-up. However, in both cases the programme can be beneficial, since companies also look for entrepreneurial managers, i.e., managers being able to spot opportunities for businesses and being willing to take risks. Therefore, it is much about having the right mindset, the entrepreneurial mindset, because it helps you to be more creative and spot opportunities where other people might not. The students will probably also expect a holistic approach, which would enable to involve students from different disciplines.

The programme could make them feel more legitimate, if it makes them feel that their voice is being heard and that their contribution matters. By providing them with more knowledge and understanding, they will be able to better defend their thoughts and ideas. In addition, it can increase the sense of belonging to the discussion. The staff members did not favour the formulation of climate activism but suggested that it can for instance strengthen the participants' sense of belonging to entrepreneurial associations, and in that way could give a more legitimate role in the field.

Practical Role in the Society

10. *What goals would your students have for their community?*
11. *What would help your students gain self-confidence and become more effective in developing sustainable entrepreneurship projects?*

The students could be the advocates towards their communities, and could, as a part of the programme, use different communication channels for spreading the word. The programme participants could form a small community among themselves and e.g., measure their own individual carbon footprint, where also a gamification aspect easily could be brought in. Creating a community, where people support each other would be of relevance, and to inform them about communities being around, which can assist and support in certain matters. A community guideline could be included to support this and to inform about what communities are out there and how they can help.

For gaining self-confidence, the design of the programme as an including programme is essential. It would be important that everyone can find their niche, and then add value to the whole. It becomes like a snowball effect, if it is evident that the background doesn't matter, and everyone is made aware that they matter. It is important to stress that it is not only about technology, but knowledge from different disciplines is needed in the energy transition. The students will gain self-confidence, if the programme include parts where the participants can get the feeling of success and a "I can do it" feeling, i.e., that they can come up with good ideas and develop them further.

4.6. Annex VI - Focus groups at Vrije Universiteit Amsterdam (VUA)

The main conclusion of the two focus groups at VUA is that there is clear interest for and even need for a course in Entrepreneurship in Renewable Energy. Results of the focus groups also highlight several issues.

First of all, where in the curriculum should this course be placed. Given the complexity of the subject, an elective in a Master programme might seem to be the best position, though a lighter version could be offered in a Bachelor programme as well.

Second, who is the target group for this course. Is it a course for science students taking entrepreneurship, or for entrepreneurship and business students taking the subject of renewable energy, or something else? If it is a master's elective, then positioning the elective as an entrepreneurship course for science students seems to the best. The course can also be opened for multidisciplinary teams consisting of students from science, business, and law. However, the experience at VUA is that this needs a lot of coordination between the different faculties (and tenacity to convince the various faculties). Next to that, VUA has clear rules on team efforts and individual efforts for assessment of students.

Third, how do we make this course distinctive from other courses that are already taught. VUA, for example, offers the courses Entrepreneurship for Physicists and Entrepreneurship in Biomedical Physics and Technology. The EntRENEW course may start with connecting the course to certain Masters, with exceptions for other interested students. The different courses can be combined in a smart way, in order to realize scale economies.

Forth, where do we find the balance between 'learning for entrepreneurship' and 'learning about entrepreneurship'. The first aims to make students better entrepreneurs, whereas the latter aims to make students experts in the field of entrepreneurship. The emphasis with the first is with practical business development, whereas the emphasis with the second is to make students familiar with applied theories in the field of entrepreneurship. VUA tends to combine the two perspectives, and to position itself somewhere in the middle.

4.7. Annex VII – External validation report of EntRENEW course and LOs

"Gaël LE BOULCH
En charge de l'Open Innovation Clients Particuliers
EDF – Commerce - DMEX
20 Place de la Défense
Bureau 26A23
92050 Paris La Défense Cedex
gael.le-boulch@edf.fr

A. *Concerning the 5 learning objectives of the course*

The selection of the 5 learning objectives seems to me justified.

For LO2, the analytical approach of the business model (BM) should be completed by a knowledge of the major players such as: financial, installer, operator/maintenance, purchase/trade. Depending on the role in relation to which one is placed, the BM is not the same. We must provide this filter to students.

LO3 seems very ambitious to me. In France, until now, energy management has been largely a matter of subsidies. As long as the State or the communities pays, nobody wants to ask questions about alternative and future BM. Unless it is to obtain a grant for this thinking.

For LO4, it would be interesting to develop analysis grids. I'd be happy to look at those.

For LO5, it seems very ambitious. On the contrary, the cross-functional aspect seems to me very difficult in this sector where everything is divided up and siloed to solve the complexity (engineering approach). Again, I'm interested in the method to achieve this. If you manage to get good results with LO5, you will interest all the energy and financial people. LO5 implies a collective and individual risk management in terms of "design" which is not obvious. In my opinion, there is no real renewable energy ecosystem to date: just plumbers, electricians, mechanics, and energy specialists who see this as an additional source of income. No real design, no structured ideology. Just politically correct values. And on top of that, we have a labor shortage in these trades as we know. It would be important to make students work on the design issue.
http://www.influencia.net/fr/actualites/in,revues-influencia,desir-design,11407.html

B. *Concerning the 4 modules and their implementation*

There are 3 modules that follow one another over a semester (3-4 months) with individual evaluation entitled module 1, 2 and 3, and a module 4 (to launch the Start-up) that takes place in parallel which takes the form of a pre-incubation workshop that can be evaluated in group. It's very interesting.

It is module 3 which of course seems the most interesting. Do people need to have validated/confirmed with a test a minimum of technical knowledge before going to 3 modules or is everything done in parallel without checking the acquisition of knowledge? Also, what about the good understanding and

the complementarity of the teams in module 4? How will you evaluate this point which seems to me essential for the continuation and the success of the project? A good team has the right to pivot in its project, but it is more difficult to change team members. It is important to evaluate them on "what to do in the medium / long term", a kind of work plan (we see their creativity, pragmatism, and ambition). But above all, the responsibilities of each person in the face of unforeseen difficulties that may arise. Do you have a test to assess individual and collective behavior in case of crisis? Do you have a test to assess individual and collective behavior in case of crisis? Appreciation and shared awareness of everyone's reactions in a stressful situation?

The prerequisites include an entrepreneurial desire or a first experience (successful or not) in creating a company. They are young. When they enter the programme, they should be asked to define what renewable energy, entrepreneurship and sustainable development are (and what is at stake). EntRENEW risks having interesting surprises and consequent gaps between the expectations of the programme and theirs.

C. The articulation between contents and outcomes

1. Module 1 and LO1, LO4 articulation

LO1 is not really fixed, and the European Commission is imposing an additional layer of Directives. It will not be easy for young people to assimilate all this. Even more so considering that the content outline will be further detailed. Moreover, the 2030 Agenda is too narrow. It talks about energy issues but what about technological breakthroughs in hydrogen, storage, the return to grace of nuclear power (where it is a societal break, not a technological one). It would be good to have students work on the ruptures (technological, social, ideological, generational). Our world is fragmenting. It is important to keep this in mind. Conventional energy is still the preserve of the engineer who knows and everyone else is silent. In renewable energy, the debate is permanent. This is where the EntRENEW programme will find interesting content for the content outline you defined.

2. Module 2 and LO1, LO2 articulation

The trends discussed here are not breaks. It is therefore complementary to Module 1 if it deals with breaks. The trends allow us to broaden the scope of possibilities, the perimeter of value creation. When we install wind turbines, we can no longer raise livestock, only cereals. So, energy has an impact on everything. The perimeter is wide. For example, if people change their diet, by becoming more herbivorous, they accept renewable energies more easily. Meat eaters generally want nuclear. It's not the same exploitation of the relationship with nature. You risk having to add a philosophical dimension to feed the ideological reflections that are more and more decisive for the success or not of projects. There is not just one "sustainable development", just as there is only one "techno-push".

3. Module 3 and LO2, LO3, LO4 articulation

I understand better now, in light of module 3, but my previous thoughts are still valid. I think this module largely contributes to LO2, and a little to LO5 as well. I would be most interested in the content of this part! (But everything is interesting!). This is very ambitious as module content.

4. Module 4 and LO1, LO2, LO3, LO4, LO5 articulation

I see this module 4 as a feedback loop or conclusion. The concern I have is that it only talks about the project. Not the team, not the contributions of everyone. And how the whole is more than the sum of the parts. Both in the team and in the contribution of the project to the company. The deliverables here are too macro. I would like more human, business plan and description of an ideal "dream team". I would go down to the level of skills. I would include the algorithmic dimension: what algorithms do I need to succeed in my project? What data do I need? Recovered by whom and how? (The CNIL will add why...).”

[The CNIL is the Commission nationale de l'informatique et des libertés (National Commission on Informatics and Liberty), an independent French administrative regulatory body whose mission is to ensure that data privacy law is applied to the collection, storage, and use of personal data].