European Institute of Innovation & Technology

EIT HEI Initiative

HEI Initiative Training Handbook

CloudEARTHi

Innovation & Entrepreneurship for Big Data in Environmental Sciences, Sustainability and Circular Economy

Funded by the European Union

Table of Contents

Executive summary ---------- 3
The process, from start to finish of the training programme development ---------- 3
Aim and goals ---------- 3
The process from start to end ---------- 4
1- Map the needs of the CloudEARTHi project ---------- 4
2- Reviewing of existing teaching materials ---------- 6
3- Developing and creating the first set of teaching material ---------- 10
4- Reviewing the first set of teaching material by experts ---------- 11
5- Creating a revised set of teaching material ---------- 14
6- Open access material ---------- 15
7- Future update and sustain the development process ---------- 16
The training programme title, description, learning outcomes, assessment methodology and implementation results ---------- 17
Delivery method ---------- 18
The timeline of the training programme development and implementation ---------- 18
The lessons learned and improvement action plan ---------- 19
Other relevant resources & associated material ---------- 19
Conclusion ---------- 20

Executive summary

This report outlines the process of developing a training programme focused on innovation, entrepreneurship, and the utilization of big data in environmental sciences, sustainability and circular economy. The programme aims to be inclusive, easily transferable, and scalable to partner institutes and beyond. It aligns with the goals of the CloudEARTHi project, emphasizing the transition to a circular economy and the pursuit of net-zero goals. The programme also includes a mentorship component and a new business model canvas to support students in creating green-friendly business ideas.

The development process is described in several steps. Firstly, the needs of the CloudEARTHi project and partner institutes were mapped to ensure alignment with overarching goals and individual contexts. At the consortium level, it was decided that the programme should target bachelor/master-level students and cover topics such as ecosystems, entrepreneurship, sustainability, big data, and innovation. High-quality teaching materials meeting EU standards were emphasized. At the partner level, several bilateral and trilateral meetings were conducted to adapt the rules and needs based on each partner's requirements. Existing teaching materials were then reviewed for suitability. A search process was undertaken to identify relevant materials and courses at partner institutes, and a list of usable courses was compiled. Next, the first set of teaching material was developed based on identified needs, existing materials, and partner institutes´ competencies.

The training programme consists of five modules, with each partner institute responsible for developing one module. The subsequent pilot phase of teaching was followed by a thorough review process conducted by experts. Reviewing forms and guidelines were prepared, and reviewers provided feedback on the teaching materials, assessing their effectiveness in introducing topics, connecting to entrepreneurship, accommodating timeframes, and achieving learning outcomes. A revised set of teaching material was developed addressing the reviewers´ comments. All the developed teaching material is made openly, freely and accessible through the project website in order to make it available to be transferred to other higher education institutes.

In addition to the primary goal of developing the training programme, there is a focus on sustainability and long-term viability. The report documents a plan to sustain and further develop the training programme by leveraging other EU projects. This strategy ensures that the programme can continue to thrive beyond the initial funding period, providing ongoing benefits to students, institutions and society at large.

The process, from start to finish of the training programme development

Aim and goals

The primary objective of the training programme is to develop an inclusive educational initiative supported by comprehensive teaching materials that focus on the intersection of innovation, entrepreneurship, and the utilization of big data in environmental sciences, sustainability, the circular economy, and the pursuit of net-zero goals. Our aim is to create a programme that can be effectively implemented across our partner higher education institutes,

transcending cultural differences. Furthermore, we strive to ensure that the training programme can be easily transferred and scaled up to other institutes beyond our partnership.

The intentional selection of this topic aligns with the core activities of the CloudEARTHi project and also reflects our commitment to addressing the socioeconomic challenges associated with our environment, sustainability, and sustainable development. By incorporating net-zero objectives, we emphasize the importance of transitioning from the traditional linear economy to a circular economy model, while equipping students with practical knowledge on leveraging big data to support society's transformation in confronting these multifaceted challenges. Additionally, our programme is designed to align with the smart specialization strategies of our partner countries, thus bolstering regional development goals and priorities.

In addition to our primary goal, we have secondary objectives. These objectives involve exploring diverse pathways to sustain the training programme beyond the funding period and inspiring our students through examples and success stories. A strategic element in achieving these objectives is the incorporation of a mentorship programme, which enhances the impact of the programme. This mentorship component not only enriches students' theoretical knowledge but also cultivates a practical mindset. Consequently, we have witnessed significant success in inspiring student teams to create and launch their own startups, reinforcing the programme's tangible application and generating positive outcomes. Moreover, to provide further support and tools for our students, we aimed to develop a new business model canvas that they can utilise to refine their green-friendly business ideas.

The process from start to end

Our objective in the following sections is to document the process of developing the training programme from start to end, enabling other higher education institutes to replicate the methods used. The methods employed encompassed the following steps:

1- Map the needs of the CloudEARTHi project
2- Reviewing of existing teaching materials
3- Developing and creating the first set of teaching material
4- Reviewing the first set of teaching material by experts
5- Creating a revised set of teaching material
6- Open access material
7- Future update and sustain the development process

1- Map the needs of the CloudEARTHi project

To ensure that the objectives of the developed training program are fully aligned with the overarching goals of the CloudEARTHi project and the diverse societal needs, a comprehensive mapping process was undertaken at both the

consortium level and the partner level. This approach aimed to capture and address the specific requirements and aspirations of all stakeholders involved.
At the consortium level, the collective goals and priorities of the CloudEARTHi project were carefully examined and integrated into the mapping process. This involved identifying key areas where the training program could contribute effectively to the project's overall mission and align with its strategic direction.
Simultaneously, at the partner level, the specific needs and aspirations of each individual institute were thoroughly assessed and considered. This step ensured that the training program catered to the unique contexts, resources, and objectives of each partner institution, fostering a cohesive and collaborative approach to implementation.
By conducting this comprehensive mapping exercise, we were able to establish a strong alignment between the training program's objectives, the broader goals of the CloudEARTHi project, and the specific societal needs identified. This holistic approach enhances the relevance and effectiveness of the training program, making it a powerful tool for driving positive impact and addressing critical challenges within both the project and the wider society.

a) **At the consortium level:** Several consortium meetings were devoted primarily to discussing the needs of the project. This includes:

1- Defining the level of the training programme (e.g., bachelor, master or advanced level)
2- Defining the subjects that the training programme should cover
3- Ensure qualities.

The consortium decided:

1- The teaching materials should target bachelor/master-level´s students
2- The teaching materials should cover the following topics (Figure 1):
    A. Basic knowledge and information about the ecosystems of the countries participating in the consortium. This knowledge may include, for example, how to establish a new business, the tax system and the needs of society.
    B. How to operate a business and make it profitable - Entrepreneurial basics.
    C. How to make the business more sustainable and environmentally friendly. This section should include knowledge of the environmental challenges, the green deal, the circular economy and the United Nations 2030 Agenda.
    D. How to use Big data and Artificial Intelligence to understand and analyse our ecosystem. How to define the needs and challenges facing society based on big data and AI.
    E. Innovation: how can students link the needs of society (evaluated based on point d) to the environmental challenges (based on the knowledge of point c) and create a profitable (point b) business?

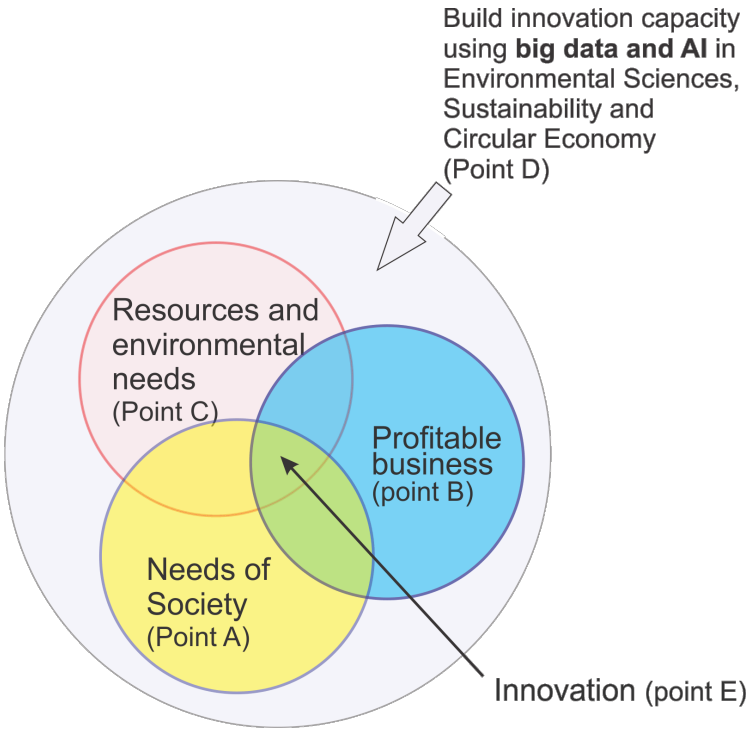

Figure 1: Schematic diagram shows the five needs defined by the consortium from the teaching materials.

3- Ensure qualities: The consortium decided to use teaching materials that meet the high-standard level defined by the consortium in alignment with the EU standard levels. For example, the teaching materials should have well-defined objectives, learning methods and clear content. Additionally, the learning methods should be adapted so that they can be taught online (due to the Covid-19 restrictions).

At the partner level: Several bilateral and trilateral meetings took place to discuss, evaluate the progress. These discussions aimed at re-adapted the above-mentioned rules and needs based on the needs of each partner.

2- Reviewing of existing teaching materials

This step of the development process addresses the review of existing teaching materials at the partners' institutes in order to evaluate their suitability for use in the developed training programme. The following describes the process for collecting and reviewing the existing teaching materials. It includes the following steps:

1. Map the existing teaching materials, courses and learning activities at the partners´ institutes that may be used.
2. Reviewing the teaching materials and evaluating their suitability to be used.

2.1 Map the existing teaching materials, courses and learning activities at the partners´ institutes that may be used

HEIs (members of the consortium) conducted a wide search process based on the above-mentioned needs and rules. Based on this search, CloudEARTHi defined a set of courses and teaching materials that can be used in our teaching programs.

2.2 Reviewing the teaching materials and evaluating their suitability to be used

The consortium reviewed the different courses and the teaching materials and came up with a list of courses that can be embedded in the teaching activities of the CloudEARTHi. Table1 shows this list.

Table1 shows the results of the search. HEIs abbreviations: FH-B (University of Applied Sciences Burgenland), TUV (Technical University of Varna), UiT (UiT The Arctic University of Norway), UA (University of Alicante), UoE (University of Edinburgh).

Course Title	Level	ECTS (Ws/SS)	Module Title	Short Description	HEI that host the teaching activity
Social Economy Social Enterprises Marketing & Fundraising	Bachelor	6	Specialisation Social Business		FH-B
International Relations and Development Policies Social Entrepreneurship	Bachelor	6	Specialisation Social Business		FH-B
Management Seminar Digital Business Processes	Bachelor	6	Specialisation Social Business		FH-B
Innovation Management and Business Models	Master	6	Business Law	Analysis of entrepreneurial opportunities and risks due to technological and societal trends, methods for developing innovative products, services and processes; developing and presenting integrated business models and business plans	FH-B
Sustainable Economy	Master	6	Business Law		FH-B
European Studies -Green Deal	Master	3	European Economics & Sustainable Development		FH-B
European Studies -Green Deal	Master	3	Lobbying & Negotiations		FH-B
Data Science	Master	3			FH-B

Human Resource Management	Master	3			FH-B
International Wine Marketing	Master	6	Current Topics Wine Marketing	Current developments and their impact on the international wine industry and related sectors, e.g. food and beverage production, tourism and gastronomy, sustainability, slow food, natural/orange wine, craft beer, spirits.	FH-B
Energy and Environmental Management	Bachelor	3	Business and law I + II		FH-B
Business Administration I + II	Bachelor	2.4	Business and law I + II		FH-B
Case studies in Business Administration I + II	Bachelor	1.1	Business and law I + II		FH-B
Special topics on Business and Law	Bachelor	3	Business and law I + II		FH-B
Building Technology and Building Automation	Bachelor	3	Language and Methods		FH-B
Learning & Creativity	Bachelor	1			FH-B
Sales & Presentation	Bachelor	1			FH-B
Business Administration	Bachelor	2.4	Business and law		FH-B
Case studies in Business Administration	Bachelor	1.1			FH-B
Building Technology and Building Automation	Master	3	Language, Social Competence & Innovation		FH-B
Innovation Leadership & Entrepreneurship	Master	3			FH-B
Digital Building Management	Master				FH-B
Building Information Modelling - Fundamentals	Master	2			FH-B
Building Information Modelling - Building Management	Master	2			FH-B
Data Protection - Fundamentals	Master	2			FH-B
Software tools for AI (phase i)	Master	3		Introduction to modern software tools and programming languages for data processing and implementation of AI – Python, R, Matlab, Weka	TUV
Fundamentals of AI (phase i)	Master	3		Introduction to AI fundamentals and techniques – algorithms for classification, regression, search, etc.	TUV
Information acquisition and interpretation (phase i)	Master	3		Methods and specifics of data acquisition, data pre-processing and conditioning – filtering, artifact removal, etc. Signal analysis and feature extraction.	TUV

Data modeling (phase ii)	Master	3		Approaches and techniques for modeling of processes and use of AI-based methods for prediction and data generation.	TUV
Hardware platforms (phase ii)	Master	3		Advanced course, presenting the specifics of the hardware involved with the various stages of the data analysis – from data acquisition – stationary and mobile data collection platforms, to data processing - computational devices, networks, etc.	TUV
Visual analytics (phase ii)	Master	3		Course-related to modern techniques and software tools for data visualization and presentation.	TUV
Big data and cloud computing (phase ii)	Master	3		Creation and structuring of databases. Fundamentals of cloud storage and computing tools and techniques.	TUV
Advance topics in AI (phase ii)	Master	2		Advanced and contemporary topics in AI.	TUV
Ethical and non-bias AI (phase ii)	Master	2		A course dedicated to AI ethics, standards, and regulations.	TUV
Carbon footprint calculations	Master	5		Two days online workshop to highlight the importance of calculating the Carbon footprint for newly established startups using real examples	UiT
Foresight basics: Introduction to future thinking	Master/ Bachelor	1.5	Foresight and Social Change	Basic knowledge and tools to deal with complexity and develop strategic skills. Introductory module to Futures Studies: drivers and scenarios for decision making and social innovation.	UA
Environmental future: Climate changes, social change and communication	Master/ Bachelor	2		Overview and Analysis of European initiatives concerning Environmental Futures. Climate Change management, Social Change, Lifestyles, Culture and Narratives from the extrapolative to the creative and thought-provoking.	UA
Future for the sharing and collaborative economy	Master/ Bachelor	1		Alternative Scenarios for the "new economy" in general as an alternative (including circular, gig, etc…), and the sharing and collaborative economy. Free market, regulatory frameworks, creativity and social innovation.	UA

Human futures: Technological breakthroughs and the sustainable society	Master/ Bachelor	3		Alternative Futures concerning the merging of man and machine (technological disruption and social change), its relationship with the environment, sustainability and resilience	UA
MA In Sustainable Development	Master	3		Social consequences, Patterns of development and opportunities for change	UoE
Global Environmental Challenges	Master	2		Innovation opportunities around global warming, ecosystem disruption and diversity loss	UoE
Carbon Innovation	Master	2		Carbon footprinting, Value ecosystems and energy systems + politics	UoE
Carbon Management	Master	2		Carbon footprinting and methods of managing reductions. Climate Change	UoE
Entrepreneurship and Innovation	Master	2		Exploring how entrepreneurship can create new startups and support existing corporates to innovate	UoE
The Value of Data for Entrepreneurs	Master	3		short online modules to support entrepreneurship and the use for data in developing new companies	UoE
Data ethics	Bachelor	2			TUV
Data Visualisation	Bachelor	2			TUV
Data for Good	Bachelor	1.5			TUV
Design Thinking for Data and AI	Bachelor	3			TUV
AI and responsible design	Bachelor	3			TUV
Entrepreneurship start-up leadership skills	Bachelor	3			TUV

3- Developing and creating the first set of teaching material

Drawing upon the identified needs, existing materials, and competencies within the consortium's partner institutes, a comprehensive training programme consisting of five modules was meticulously crafted. Each partner institute assumed responsibility for developing a specific module, capitalizing on their expertise and resources.

In the forthcoming section titled "The Training Programme: Title, Description, Learning Outcomes, Assessment Methodology, and Implementation Results," a detailed presentation will be provided, encompassing the learning outcomes, course objectives, comprehensive descriptions, assessment methodologies, and the tangible results achieved through the implementation of the training programme.

4- Reviewing the first set of teaching material by experts

Following a two-month pilot phase of teaching, the developed teaching material underwent a rigorous review process conducted by experts. The purpose of this review was to ensure the quality and alignment of the objectives, methodologies, and assessment methods employed within the teaching materials. In the subsequent sub-section, we will provide a concise overview of the reviewing process, detailing the methods employed and the actions taken to ensure effective quality control of the teaching materials in the CloudEARTHi project.

The process includes the following steps:

1. Preparing a reviewing form and guideline for the reviewers
2. Getting the comments and the feedback from the reviewers

4.1. Preparing a reviewing form and guidelines for the reviewers

The consortium has developed a set of guidelines and rules that we want reviewers to take into account during their review process. These rules aim to ensure the high quality of the educational materials that we provide to our students.

The following is the form that was sent to the reviewers which includes a short description of the course, the full set of the educational materials and 4 questions that we asked the reviewers to assess:

Points to consider during the evaluation

We asked the reviewers to consider 4 main points during the evaluation which are:

1) **Does the material presented in the module adequately introduce the topic to students who have no prior knowledge of the subject?**
2) **Does the material presented connect to the overall topic of entrepreneurship?**
3) **Can the material presented be covered in the prescribed time?**
4) **Does the material presented allow for the described learning outcomes to be achieved?**

4.2. Getting the comments and feedback from the reviewers

Module1 (Local knowledge base) cannot be assessed since this module is performed face-to-face. Module2, 3, 4, and 5 were sent to the reviewers. The following is the feedback from the reviewers on the different modules:

Module2: Entrepreneurial basics (online)

1) Does the material presented in the module adequately introduce the topic to students who have no prior knowledge of the subject?

Module 2 course materials "Entrepreneurial basics" appear to introduce the topic to the students who have no prior knowledge of the subject. Business start-up basics and the nature of circular business are introduced well. Business model canvas is well integrated as a pragmatic approach to develop ideas.

One suggestion is to add a short introduction video (3 min maximum) like Module 1 has. It would be good to have an overview /roadmap of the main Module 2 lecture and supplementary YouTube videos and business model materials and students' assignment upfront. As the material starts with the main lecture with the subject area, it is somewhat unclear what the relationships are between these various links provided.

2) Does the material presented connect to the overall topic of entrepreneurship?

Yes, but it would be good to show the overall structure of the materials provided at the very start. See comments above.

3) Can the material presented be covered in the prescribed time?

The Module 2 main lecture is quite long (1 hour 31 minutes), and it might be good to make this into different parts with some sign-posting, so the students could come back to the lecture when they want to look into specific sections.

4) Does the material presented allow for the described learning outcomes to be achieved?

Overall, yes. The key issue is that the main lecture is very long. Watching an online video over 90 minutes could be tiring for students. The contents and methods are fine, but the presentation structure could be clearer.

Module3: Sustainability & circular economy (online)

1) Does the material presented in the module adequately introduce the topic to students who have no prior knowledge of the subject?

The material presented in module 3 introduces the topic of sustainability by offering a needs-based approach and sensitizing students to the issue of global warming, which of course is a valid approach and allows students who have no prior knowledge of the subject to find an entry point to the topic. However, the lecture seems a bit piece-meal and needs to connect to all the issues so well covered in the interview. Also, some key terms should be introduced at the beginning (sustainability, circular economy, Agenda 2030) to allow students to connect the dots more easily.

2) Does the material presented connect to the overall topic of entrepreneurship?

The material presented does link to the overall topic of entrepreneurship, but it could offer some clearer examples for doing business in a circular economy or for doing business in an environment that looks at evolving towards a more sustainable way of doing business. Aspects such as e-waste and sustainable consumer behavior could enhance the module and make it more tangible to the target group.

3) Can the material presented be covered in the prescribed time?

Students can well cover the material in the prescribed time. They can also make great use of the podcasts and the interactive atlas to get involved in the topic of sustainability.

4) Does the material presented allow for the described learning outcomes to be achieved?

As learning outcomes, students are expected to understand the key concept of sustainability and understand in what ways the circular economy differs from the standard line economy model. They should be able to expand a business model to a business model responding to the needs of a circular economy and evolve a standard business model into one that considers circularity and sustainability. To this end, I suggest adding a very inspiring and important TEDxTalk given by Ellen MacArthur: https://www.youtube.com/watch?v=ooIxHVXgLbc This talk contributes to an overall understanding of why sustainability is a really pressing issue for all of us.

Module4: Big data & AI (online)

1) Does the material presented in the module adequately introduce the topic to students who have no prior knowledge of the subject?

The teaching materials presented in module4 introduce the topic of big data and AI to the students. The materials provide the students with a comprehensive overview of the topic.

2) Does the material presented connect to the overall topic of entrepreneurship?

The presented teaching material is highly relevant and connected to the topic of the module and to the overall objectives of the course. The materials explain how students can use big data and artificial intelligence in developing their business ideas and how to ensure that the business ideas are aligned with the European Green Deal and the EU taxonomy.

3) Can the material presented be covered in the prescribed time?

The time required for this module should be increased since students will practice writing code and analyzing existing big data. 15 hours are not enough for that. In addition to the 15 hours of instruction, the module includes a mentoring component where students can interact directly with the teachers (this gives the students more time to digest the topic).

4) Does the material presented allow for the described learning outcomes to be achieved?

Yes the presented materials are linked and serve the learning outcomes of the module and the course in general.

Module5: Innovation (online)

1) Does the material presented in the module adequately introduce the topic to students who have no prior knowledge of the subject?

The course materials presented in module 5 is meant to present the topic of innovation to the students who have not prior knowledge of the subject, and with this in mind, it certainly serves the purpose. It is, however, presented from a rather theoretical angle and may be a challenge for many students not familiar with the

topic. However, Professor Bas makes a great effort to provide sufficient context to allow beginners to understand key aspects of innovation.

One suggestion is that students really should take time to examine the links he provides very closely, so as to be able to follow the lecture to its full extent.

2) Does the material presented connect to the overall topic of entrepreneurship?

Yes, it does, but it is important to understand the concept of Foresight first – a concept Prof. Bas goes into repeatedly.

3) Can the material presented be covered in the prescribed time?

Students are allotted about 15 hours working time for this module and the material provided can be covered in the prescribed time. The lecture takes about one hour, and if students look into the various links and do the exercises, the module can be managed in the prescribed time.

4) Does the material presented allow for the described learning outcomes to be achieved?

Students should be able to explore business options and pitch an idea at the end of the module. This should be possible, if some more input is provided in terms of how to properly pitch. The students get a solid background on the theory that lies behind innovation and to properly explore business options and design a good pitch, the material does not provide enough direct input in terms of what it takes to pitch an idea. This can be easily remedied by providing some material available on youtube, which is helpful for the practical preparation of a pitch. E.G. https://www.youtube.com/watch?v=XWRtG_PDRik

5- Creating a revised set of teaching material

The following action was taken by the consortium after gathering and processing the individual module reviews. Contributing colleagues from the consortium were sensitized to checking the existing materials and to adapting them to local needs/requirements and individual target groups (sub-sets of students from various backgrounds and course programs) as they see fit. They were also called upon to review and – if required – update the material at the end of each semester to further reduce the need for individual tutoring and to continuously improve the material provided. Overall, the student course was adapted to become simpler, more task and outcome-oriented, while giving them a solid, logically well-structured overview of the topic of doing business within the framework of a new economic paradigm, the circular economy.

Also, the student course section was expanded by additional offerings that go beyond the core student training course.

Module 1: no action was taken here, as it was not reasonable to give feedback to this module. Module one relates purely to the local entrepreneurship ecosystems in the various countries that make up the consortium. It mainly deals

with questions related to the local ecosystems and is designed to be delivered in the respective countries, if possible, as face-to-face offer on campus.

Module 2: The reviewers asked for a clearer structure of the material presented. University of Applied Sciences of Burgenland revised the contents and split it into clearer sections and added more templates for basic business model canvassing to offer a better choice for managing the task 'write a business model canvas'.
Also, introduction videos were added not only to this module, but also to modules 3, 4, and 5, so students can better follow the logic of the course.
The recorded lecture was removed, so now students can actually focus on learning about business management basics and the task of devising a business model canvas that fits their individual business idea within the prescribed time (approx.15 hrs).

Module 3: The slide set was enriched by additional information regarding the concepts of sustainability, circular economy and Agenda 2030.
The recorded lecture was moved to a section 'optional input', as it no longer reflects the slide set used to introduce the topic of sustainability and circular economy.

Module 4: More time was given to this model. We asked the professors who teach this module to mentor the students in smaller groups and give them more practice (simple exercises) to pave the way for the students to understand the theoretical concepts behind analysing big data and using AI. This module becomes more comprehensive but in a simple way that students can follow.

Module 5: The theoretical approach of this module was supported by some hands-on tips on how to prepare a successful business pitch. While the theory behind acting as an innovative entrepreneur should allow students to put their individual business ideas into a larger perspective of an overall business phenomenon, they now also have some very easy-to-follow guidance on how to best present their ideas.

6- Open access material

We firmly believe in the principle of open access, making all the developed training materials freely available for use by any higher education institute. This commitment stems from our desire to foster knowledge dissemination, encourage collaboration, and facilitate the transfer of the developed material to other institutions. By providing open access to the teaching materials, we aim to empower educators and students worldwide to benefit from the valuable resources we have created.
To ensure widespread accessibility, the developed training material is openly and freely accessible through the dedicated website: https://cloudearthi.com/basic-materials2/. This user-friendly platform enables easy navigation and retrieval of the teaching materials, allowing educators and learners to engage with the content seamlessly.
In addition to the current website, we are in the process of creating a robust new website: MOOC.CloudEARTHi.com. This website will serve as a centralized hub, making all the teaching materials for this training programme, as well as

other programmes, readily available. The MOOC platform will offer an enhanced user experience, facilitating efficient searching, browsing, and utilization of the educational resources. It will further promote engagement and interaction through various interactive features and collaboration tools.

By embracing open access principles and establishing dedicated platforms, we ensure the sustainability and wider dissemination of the developed training materials. This approach allows us to contribute to the global knowledge-sharing ecosystem, making valuable educational content accessible to a broader audience and fostering continuous learning and innovation in the field of innovation, entrepreneurship, and big data in environmental sciences.

7- Future update and sustain the development process

In our commitment to continuous improvement and staying at the forefront of innovation in education, we have outlined a plan for future updates and the sustained development of the teaching materials. This plan encompasses collaborations with other projects that have evolved from the parent project, CloudEARTHi. An example of such collaboration is our involvement in the EU SEEDplus project, where we are actively working to enhance the teaching materials by incorporating insights from the Ukrainian entrepreneurial ecosystem.

The collaboration with the EU SEEDplus project provides an excellent opportunity to enrich the existing training materials with the specific knowledge and experiences garnered from the Ukrainian context. By integrating insights into the entrepreneurial landscape and practices within Ukraine, we aim to offer learners a comprehensive understanding of the regional dynamics and foster an entrepreneurial mindset that is attuned to the local context.

Furthermore, our future update initiatives extend beyond specific collaborations and incorporate ongoing feedback loops from trainers, learners, and experts. We value the input and insights from our stakeholders, and their feedback serves as a catalyst for iterative improvements and enhancements to the training materials.

As part of our sustained development process, we are committed to ensuring that the training materials remain relevant, up-to-date, and responsive to the evolving needs of the educational landscape. We actively monitor emerging trends, research findings, and industry developments to incorporate the latest insights and best practices into the materials. This proactive approach ensures that learners benefit from the most current and valuable knowledge in the field of innovation, entrepreneurship, and big data in environmental sciences.

Through these future update and sustained development efforts, we are dedicated to creating a dynamic and ever-evolving training programme that remains at the cutting edge of educational excellence, equipping learners with the skills and knowledge needed to navigate and succeed in the rapidly changing landscape of innovation and entrepreneurship.

The training programme title, description, learning outcomes, assessment methodology and implementation results

Course name: "Innovation & Entrepreneurship for Big Data in Environmental Sciences, Sustainability and Circular Economy – Basic course and mentoring program"

Course structure:

1) Five-tier (modules)-structure – blended learning
    - Module1: Local knowledge base (f2f)
    - Module2: Entrepreneurial basics (online)
    - Module3: Sustainability & circular economy (online)
    - Module4: Big data & AI (online)
    - Module5: Innovation (online)
2) Electives / summer school / possible integration into existing curricula
3) 30 units (max. 75 hrs of workload) / 6 units (approx. 15 hrs per module)

Learning outcomes:

- Participants are able to describe fundamental business management and legal principles related to setting up a company and to draw up a business plan in a digital and/or circular economy framework.
- Participants recognize tasks and procedures in innovation and technology management and are introduced to the related terminology.
- Participants are able to draft a circular business plan and to are aware of challenges related to setting up and securing a business.
- Participants are enabled to develop a business idea, recognise the necessity of obtaining external expertise and understand how to find support.

Methods (not all methods are applicable to all modules):

- Case studies
    - analyse in depth an area of interest, person, event, organization, policy, law etc.
    - variety of perspectives, using both quantitative and qualitative research techniques
    - should have a clear connection to topic
- Presentations
    - encourage development of oral presentation skills and allow students to

- synthesize knowledge and develop expertise
- encourage active listening: peer assignments

- Hands-on labs
  - people learn most effectively when there is interaction with the subject at hand
  - Statistics: learners manipulate data
  - Programming: learners code
- Debates
  - develop 21st century skills:
  - critical thinking, communication, collaboration, information literacy, self-direction, and presentation.
  - debates come in various formats – check group size

Delivery method

Most of the course was delivered online using Zoom sessions with the exception of module 1 which was delivered face-to-face.

- Module1: Local knowledge base (f2f)
- Module2: Entrepreneurial basics (online)
- Module3: Sustainability & circular economy (online)
- Module4: Big data & AI (online)
- Module5: Innovation (online)

The timeline of the training programme development and implementation

The training programme is designed to span a duration of eight weeks, incorporating a range of interactive educational activities. Throughout this period, participants will engage in sessions with experienced teachers, fostering meaningful discussions and providing guidance on the subject matter.

Structured modules are strategically integrated into the timeline, covering key aspects of innovation, entrepreneurship, and the use of big data in environmental sciences. These modules offer a balanced combination of theoretical knowledge and practical application to facilitate comprehensive learning.

The timeline also allows for assessments, enabling learners to evaluate their progress and receive valuable feedback. These assessments serve as checkpoints to measure learning outcomes and support ongoing improvement.

The carefully planned timeline ensures an optimized learning experience, balancing content coverage with meaningful engagement. It provides participants with a structured framework for effective comprehension and application of the material.

By adhering to this timeline, learners gain valuable knowledge and skills in the fields of innovation, entrepreneurship, and big data in environmental sciences, empowering them to excel in these domains.

The lessons learned and improvement action plan

Throughout the development and implementation of the training programme, valuable lessons have been learned that contribute to its ongoing improvement. These insights have been carefully analysed to identify areas for enhancement and optimize the learning experience. Based on these lessons learned, an action plan has been formulated to drive and sustain continuous improvement and address any identified areas of improvement beyond the funding period.

One key lesson learned is the importance of incorporating interactive elements and engagement opportunities within the training programme. Feedback from participants has highlighted the value of interactive sessions, discussions, and practical exercises, which enhance knowledge retention and application. As a result, the action plan includes a focus on expanding and refining these interactive components to further enrich the learning experience.

Another significant lesson learned relates to the need for ongoing evaluation and assessment methods. Regular assessment checkpoints allow for monitoring of participant progress and provide valuable insights into the effectiveness of the training programme. Based on this lesson, the action plan includes a comprehensive review and enhancement of the assessment methods to ensure they accurately measure learning outcomes and provide meaningful feedback.

Additionally, feedback from participants has shed light on the importance of incorporating real-world case studies and practical examples. Learners have expressed a desire for more hands-on experiences and contextualized learning materials. To address this, the action plan includes an initiative to source and incorporate relevant case studies and examples, ensuring that the training programme remains aligned with current industry practices and challenges.

Furthermore, the action plan emphasizes the importance of ongoing communication and collaboration with stakeholders. This includes seeking feedback from trainers, participants, and experts, as well as engaging in partnerships and collaborations with external organizations and projects. By actively involving stakeholders, the training programme can benefit from diverse perspectives, expertise, and emerging trends, enabling continuous improvement and adaptability.

The action plan will be implemented through three follow-up EU projects namely “Inspiring the Minds”, “SEEDplus” and “BOOSTalent”.

Other relevant resources & associated material

The full set of educational materials can be accessed at: https://cloudearthi.com/basic-materials2/

Conclusion

In conclusion, the training programme development process aimed to create an inclusive educational initiative supported by comprehensive teaching materials that address the intersection of innovation, entrepreneurship, and the utilization of big data in environmental sciences and sustainability. The intentional selection of this topic aligns with the core activities of the CloudEARTHi project and reflects our commitment to addressing socioeconomic challenges associated with the environment and sustainable development.

With a primary objective to ensure the programme's effectiveness and scalability, we strived to make all developed materials openly accessible to other higher education institutions. This commitment is crucial for sustaining the developed material and facilitating its transfer to other institutes. The teaching materials are openly available and accessible through the website https://cloudearthi.com/basic-materials2/. Additionally, a robust new website, "MOOC.CloudEARTHi.com," is being created to make all teaching materials for this training programme and other programmes available.

Looking to the future, we are committed to updating and improving the developed material through collaborative efforts with other projects that have spun off from the CloudEARTHi project. For instance, in the EU SEEDplus project, we are working to enhance the teaching materials by incorporating the Ukrainian entrepreneur ecosystem. By continuously updating the content and incorporating lessons learned, we aim to ensure the training programme remains relevant and impactful.

Overall, the process of training programme development and implementation has been guided by a comprehensive mapping of needs, extensive review processes, and the intention to provide open access materials for wider dissemination. These efforts have enabled us to create a robust training programme that aligns with societal needs, fosters entrepreneurial skills, and leverages big data for sustainable development. We are excited to see the positive impact it will have on students, higher education institutions, and the broader community as we strive towards a greener, more sustainable future.