TIMREX: Deliverable D4.1 – Strategic implementation of innovation and entrepreneurship

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1. Introduction

This document refers to D4.1 - Strategic implementation of innovation and entrepreneurship, and defines the strategy, main ideas and pathways designed to align the hybrid approach to be used for delivering innovation and entrepreneurship modules, skills and competencies within the TIMREX project framework in support for the EIT Label for its Master's programme.

The strategic plan sets the framework for the following tasks within Work Package 4, especially the preparation and development of the innovation and entrepreneurship modules compiled based on an implementation roadmap for skills and competencies delivery. As a base document for these outputs, the actual D4.1 includes definitions for skills and competencies development, important practical factors and other preparation material, including a number of suggestions made by the research and industry partners to support the education side.

The main goal of this document is to bring to the same level the research and industry partners that will contribute to the modules to be in line with the TIMREX education driven vision, working in a supporting and coordinating manner. The resulting strategy also defines ways to foster innovation and entrepreneurial competencies for the students and could, ultimately, lead to start-up activity, and create a well-prepared workforce for junior and major companies upon graduation, one of the major goals not only of TIMREX, but also of EIT RawMaterials.

Chapters 3 and 4 of this Strategic Plan are widely based on information contained in the TIMREX project proposal, as well from two previous projects: INTERMIN (Horizon 2020 project) and MOBI-US (EIT RawMaterials). Chapter 5 is built upon the EIT Label Handbook for planning, labelling and reviewing degree programmes (from 2021).

As a strategic document, it will be monitored and adapted throughout the project implementation taking into account possible changes that need to be implemented to the strategy arising from internal and/or external inputs.

2. Objectives

A strategic plan is a document that contains the definition of goals, actions to reach those goals and related elements that might influence implementation (either positively or negatively). The strategic plan helps to set priorities, to drive the use of resources, to ensure that partners are working towards the same objectives in a coordinated manner and to leave room for adaptation in case of changing conditions in the implementation pathways. This type of document is essential within the framework of TIMREX's innovation and entrepreneurship modules teaching, since activities require participation of the three sides of the Knowledge Triangle and of a set of different actions.

The strategic plan for implementation of Innovation and Entrepreneurship modules, skills and competencies, will allow TIMREX to prepare and develop adequate corresponding modules and other activities to teach and provide students with the relevant skills and competencies during the course of TIMREX Master's program - adequate means feasible, industry led, future-proof and supported by all partners of the Knowledge Triangle and stakeholders. This plan, developed with the support of the research and industry-related partners, aligns the future development and implementation of the innovation and entrepreneurship skills and competencies in TIMREX, to support the more traditional components of teaching, thus bringing itself an innovative component to the teaching methodology.

The strategy for Innovation and Entrepreneurship skills and competencies in TIMREX is mainly focused on:

- Set up the collaborative approach between education and research and industry partners of TIMREX, bringing them to the same understanding of the hybrid approach to teach innovative and entrepreneurship principles;
- Acquire knowledge on innovation and entrepreneurship-related skills and competencies that can be offered by partners as different activities (fieldwork, mentoring, presentations during classes, etc.);
- Lay down relevant aspects of innovation and entrepreneurship views and how they complement the Master's programme;
- Analyse strengths and weaknesses of the current plan and prepare for possible changes to the plan depending on upcoming factors.

3. Innovation and entrepreneurship as viewed in TIMREX

3.1. Main concepts

- Innovation: Within TIMREX "innovation" is understood as a set of skills, both soft and hard skills, that are meant to contribute to innovative thinking and innovative geoscientific practices (mainly exploration related). The word innovative refers to the skill and efficiency in realizing and implementing innovations. It can also be understood as the ability and self-motivation of students to continually search for and use in practice scientific research, new concepts, ideas, and inventions arising from the TIMREX teaching methodology, both professionally as personally.
- Entrepreneurship: In TIMREX the entrepreneurship aspect is viewed from two points. These points are usually in opposite sides of entrepreneurship definition, but in TIMREX, they go together. First, the definition that entrepreneurship is about opportunity identification, business development, self-employment, venture creation and growth, that is becoming an entrepreneur. Second, the definition that entrepreneurship is about personal development, creativity, self-reliance, initiative taking, action orientation, that is becoming entrepreneurial. TIMREX tries to incorporate both aspects in its teaching methodology. Furthermore, for EIT, Entrepreneurship is seen as "a unique process that enables individuals with the entrepreneurial skills, mindset and know-how to turn ideas into action through a fusion of innovation, opportunity and resources" and entrepreneurship education is "the development of entrepreneurial competencies and skills, with a focus on fostering 'can-do' attitudes and innovative behaviour within the scientific research field, which is fit for a variety of contexts and challenges in industry, the world of work and society". These aspects are also considered within TIMREX's definition for entrepreneurship.
- T-shaped professionals: T-shape professionals are characterized by their deep disciplinary knowledge in at least one substance area and capability across the boundaries between disciplines in the raw materials sector. This kind of professionals usually have the ability to be innovative/innovate, build relationships, advance research and strengthen their organization, and so they are ultimately correlated to innovation and entrepreneurship skills and competencies, from where they take a lot of standout value. TIMREX will help to create T-shaped raw materials professionals with its own approach to innovation and entrepreneurial

teaching, giving students a strong suite of soft and hard skills and competencies developed into different contexts. Figure 1 describes the T-Shaped Professional Diagram.

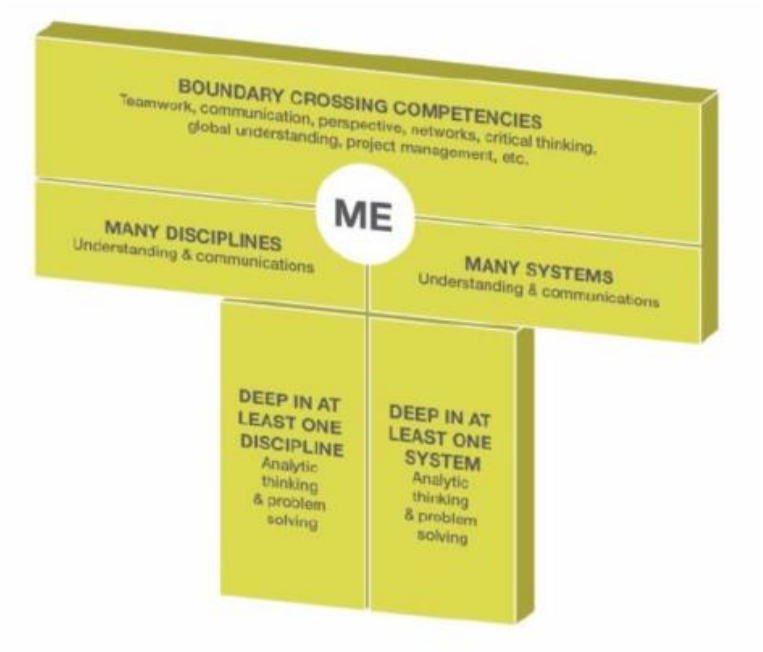


Figure 1: T-Shaped Professional Diagram from T-Summit 2015.

- Skills: Refer to a specific learned/acquired ability or expertise from performing a job – in TIMREX's case, skills will be acquired by students during classes, fieldwork, the mentoring programme, and other teaching activities. Skills can be classified into hard skills - a technical and quantifiable skill that a professional may demonstrate through their specific qualifications and professional experiences, e.g., learning and operating new exploration technologies – and soft skills - a non-technical skill that is less rooted in specific vocations, e.g., management and communication skills. Innovation and entrepreneurial focused modules of TIMREX will grant the students access to both types of skills, in support for future exploration professionals.
- Competencies: Differently from skills, competencies are a collection of related abilities and knowledge that enable a person to act effectively while doing a task or activity. For TIMREX this means the capacity of students to develop a multitude of abilities and behaviours for their school and personal lives. Examples include the improvement of business processes, strategic planning and data-driven decisions. Competencies also come in different flavours:

behavioural (life skills), functional/technical and professional competencies. Similarly to Skills, the innovation and entrepreneurial modules will allow students to get a wide range of competencies.

3.2 Sources of innovation and entrepreneurship teaching

The project is basing its educational approach on providing students with complementary skills and competencies, making them more apt for the future workplace, being it on the field, lab or management within the raw materials value chain (especially focusing on forming exploration geologists). This presupposes the teaching of innovation and entrepreneurship-related competencies and skills in support of forming T-shaped professionals.

In TIMREX, these skills and competencies are provided through modules – resulting in an hybrid approach to the teaching methodology - that will be part of the curricula in support of the EIT Label for this Master's programme, corresponding to three main pillars (Figure 2):

1) Pillar 1 - Modules embedded in the semester courses: online and presential teaching modules specifically designed to help to provide some Innovation and Entrepreneurship skills and competencies. Non-academic partners both from the industry and research institutes will strongly contribute to these teachings/trainings of the students as mentors, invited lecturers, and consultants for the curriculum development.
2) Pillar 2 - Intensive fieldwork modules: students will be able to take part in fieldwork campaigns organised by TIMREX in coordination with industry and research partners. Non-academic partners will contribute as fieldwork leaders and contributors. Innovation and entrepreneurship will be advanced by the research and industry partners, since they are within their own work lines.
3) Pillar 3 - The EFG's mentoring programme: students will participate in the EFG's mentoring programme which offers the possibilities to teach many innovation and entrepreneurship related concepts. EFG will lead this aspect but will be supported by other TIMREX partners.

The teaching methodology for the innovation and entrepreneurship aspects will be facilitated by the partnership. Education, research and industry partners (all sides of the Knowledge Triangle) will collaborate to provide students with a well-suited and complementary set of methods that give the students plenty of learning material in different formats, facilitating their learning process regarding the acquisition of innovative and entrepreneurial skills and competencies.

TIMREX will offer student mobilities between the partnering universities and organize a strong fieldwork period between M1 and M2 academic years. These field activities will give practical skills to students in field-based observation, analytical and geophysical tools, mapping, robotics as well as underwater (seabed, flooded mines) tools of exploration, which strongly contribute to their innovative and entrepreneurship skills and competencies.

The EFG mentoring scheme will valorise the experience of mentors from the industry to provide insights to students and focus on areas that the raw materials sector needs to move forward, improve itself and optimise its processes. Specifically, through the mentoring process, the mentors will develop and investigate where they think new professionals can support and what will be required. EFG mentees could take chance of the related experiences in innovation & entrepreneurship from their mentors. They will be addressed to the most suitable mentor, and together they will boost the skill development on those areas.

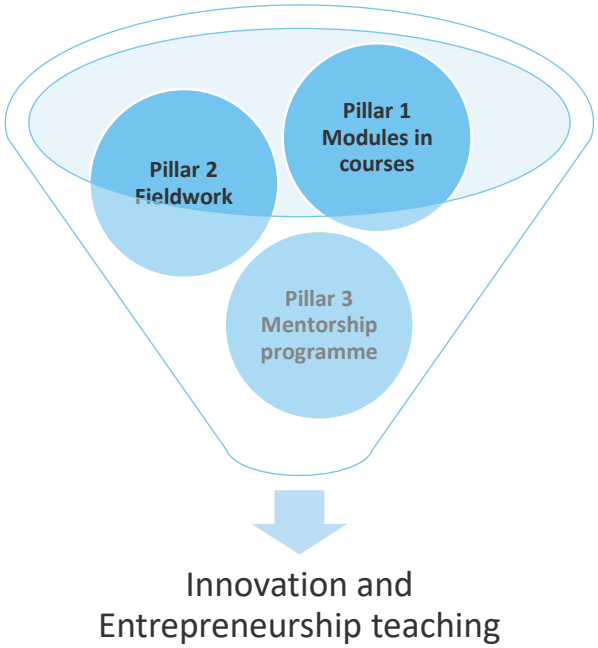


Figure 2: The three teaching pillars of the TIMREX Master's. It applies to Innovation and Entrepreneurship teaching.

3.3 Activities to support innovation and entrepreneurship teaching

Besides the teaching modules and components provided within the previous sub-chapter (which represent the primary iteration of TIMREX), this sub-chapter suggests other approaches to complement the teaching methodology for innovation and entrepreneurship skills and competencies, which can be included within the three pillars' activities. These suggestions are advanced by the research, industry and even education partners and can bring added value to the teaching process. They can be divided amongst different areas, each with its own directed set of skills and competencies

Direct add-ons to classes: adding skills and competencies on entrepreneurship and innovation - business plans development, from research to business ideas, innovation support to solve industry's challenges, communication, leadership, others.

- Combination of different science/business branches within the study - geology, chemistry, physics, mining (and other) engineering, economy, management, IT.
- Preparation of a business plan/idea as part of a course.
- Include in each type of education/teaching, e.g., tasks on solving specific industry problems (in cooperation with entrepreneurs and their real needs), teamwork and interaction with external stakeholders. These skills include identifying and framing education in terms of real business problems and setting open-ended challenges for students.
- Use the hybrid mode as: online (remote) classes followed by a period of presential training to consolidate the theoretical part so that students learn how to plan and execute a research project from the beginning.
- Make use of teamwork, with students divided into different groups working together to solve innovation and business challenges. Students can be given common theme with same input data and materials connected to mineral resources. Through internal competitions students have to find the best solution to a practical problem from the industry. In addition, students will have professional practice where they will have internship and join economic and business companies and entities where they will conduct research and collect data within different projects outside.
- Students to write articles in magazines, scientific periodicals or on the web (e.g., blogs) on topics related to the raw materials value chain and innovation.

Learning from Knowledge Triangle stakeholders: adding skills and competencies on entrepreneurship and innovation – knowledge on industry's needs, innovation and business processes, direct learning with mentors, networking, communication, others.

- Contact large companies in the raw materials sector (both within and outside the regions represented in TIMREX) and ask them to deliver a 45-minute speech on the industry's future, needs, requirements, and lessons learned from the past, with the possibility of questions and answers sessions.
- Real-work impressions/shadowing at the mentor's place of work (if possible) when implementing mentorship actions.
- Students to attend training courses / seminars / conferences on raw materials and related topics nationally and abroad whenever possible.
- Students to learn through networking and discussion groups inside and outside the universities.
- Organization of a TIMREX Summer School in selected partnership countries where innovative exploration methods are taught and showcased and entrepreneurial views in practice are provided by invited business-minded people (start-ups, SMEs, etc).

Internships & Scholarships: adding skills and competencies on entrepreneurship and innovation – knowledge on industry's needs, innovation and business processes, knowledge on innovative techniques and how to use them, critical thinking, data gathering and analysis, others.

- Offer the possibility to do short internships at partner research and industry institutions where students can have a hands-on approach on innovation and entrepreneurship.
- Offer the participation in field missions (under the scope of ongoing projects and activities).
- Use a scholarship via RIS Internship programme (link to the project 21003 RIS Internship programme: broadening University-Business Cooperation).
- Make use of professional training at the industry (exposure to the business environment).

Participation in national/international projects: adding skills and competencies on entrepreneurship and innovation – networking, communication, innovation processes, business creation and survivability, others.

- Integration of the students/studies into the innovation international projects – students are then in contact with progressive professionals.

- Students to participate in new projects / working groups on raw materials topics or even others.
- Clustering activities with other projects and activities from EIT RawMaterials, H2020, Horizon Europe and others that can offer Innovation & Entrepreneurship views.
- Calls for innovative idea incubation, such as the EIT's Jump Starter.
- Participation at entrepreneurial trainings organised by EIT RawMaterials HUB ADRIA (link to the project 17254 RCA Regional Center Adria) with duration of minimum 1 day.
- Students encouraged to participate at EIT RawMaterials programmes for young entrepreneurs such as Jumpstarter programme via organization of the teams and supervisors.

Competitions: adding skills and competencies on entrepreneurship and innovation – teamwork, leadership, communication, critical thinking, innovation process, others.

- A student competition (with awards) where the goal is to define a mining exploration problem – students then shall suggest the solution/built the appropriate exploration/mining strategies etc.
- Participation of students in national, European and international challenges; e.g., PDAC Next generation explorers Award challenge, SEG Evolve challenge.

Online teaching/learning platforms: adding skills and competencies on entrepreneurship and innovation – teamwork, communication, digital skills, others.

- Use of dedicated software or platforms for technical and collaborative work such as Trello, Slack and others.
- Make use of online MOOCs (e.g., Coursera, edX) to support teaching in areas important for creating T-shaped professionals (digital literacy, communication, etc.).

3.4 Student's effort and ECTS

For students who follow the TIMREX curriculum in its two modalities (Double degree scheme and Joint degree scheme; Figure 3), 2.5 ECTS will be devoted to innovation and entrepreneurship learning in Master 1 year as a joint online course on entrepreneurship, as part of Pillar 1. The module will involve SMEs, research institutions and EFG. Later, 5 ECTS are given as part of the joint fieldworks between M1 and M2 as part of Pillar 2 and 7.5 ECTS in the Master 2 year as the Exploration Entrepreneurship course with the EFG's mentoring program and a joint project with mentoring and

participation of SME and research institution consortium members, as part of Pillar 3. In total, TIMREX offers 15 ECTS dedicated to innovation and entrepreneurship-related skills and competencies learning during its Masters.

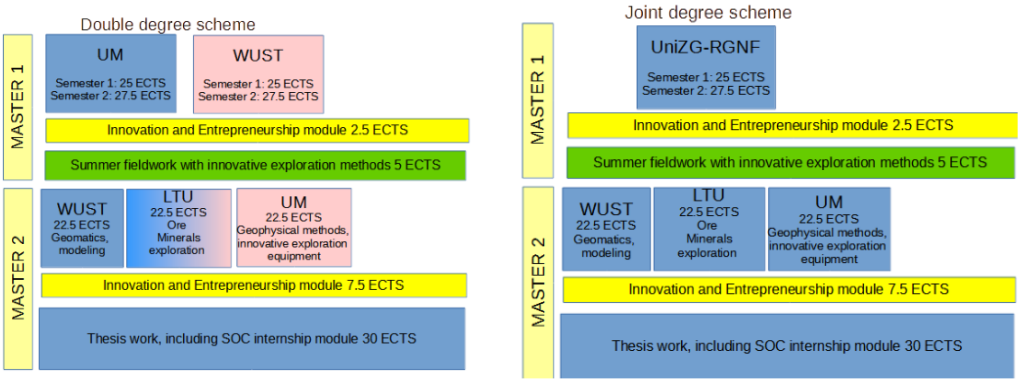


Figure 3: Double degree and Joint degree schemes envisaged for TIMREX. Innovation and Entrepreneurship modules are highlighted in yellow and green. To these the EFG mentoring programme is added.

3.5 Skills and competencies relevant for the future exploration geologists

There are several innovation and entrepreneurship-related skills and competencies that are already under consideration at this moment as part of the TIMREX strategic plan. These derive from previous knowledge gathered in projects (e.g., H2020 INTERMIN, EIT RawMaterials MOBI-US) or professional aspects by the project partners. Some examples of skills and competencies already planned to be delivered are listed on Table 1 below.

Table 1: Envisioned Skills and Competencies that can be provided to TIMREX Master's students on Innovation and Entrepreneurship-related teaching.

Innovation
Skills
Research and experiment
Technology installation and maintenance
Technology use, monitoring and control
Technology design and programming
Data processing including neuron networks
Programming and database management
Advances in robotics and automation

Computing, new technologies and the internet
Adapt theory to practical physical problems
Finding robust solution for statistical problems in a quality checked way. To tend to analyze datasets knowing its origin and reliability
Laboratory analytical techniques and their limitations
Project design
Solve problems under pressure and in a short period of time, a strong engineer sense that can be “triggered” in students
Polishing and microscope techniques
Geological and structural mapping
Geophysical research technics
Metallogenic studies, prospectivity assessments and mineral exploration (metal, non-metal and energy)
Soil, stream sediments and rock sampling for prospectivity assessments
Re-assessment of mining wastes (including sampling)
UNFC resource classification system
Drone photogrammetric studies
SEM/EDS analyses of rock and environmental samples
Characterization of the elemental composition – using XRF
Mining wastes and secondary raw materials analyses.
Primary raw materials (metal, non-metal and energy) – composition and metallogenic factors
Approach complex geophysical problems in an innovative way by modeling and computer processed interpretation
Geoinformatics software (GIS, 3D modeling...)
Write/adjust program modules in Python (or other progam language)
Geostatistics
Portable spectroscopic techniques and their applicability and limitations (hyperspectral, XRF, LIBS, SWIR)
Robotization and underwater exploration techniques, including seabed exploration. and underwater observations
Exploration technique development derived from research projects such as UNEXMIN, UNEXUP, ¡VAMOS!, or other projects related with geo-technologies, mineral and geological resources, or geo-exploration.
Competencies
Analysis of Data – the student can quickly understand and draw paths to solve a difficult problem; the student is able to analyse details, data and facts and challenge them prior to making decisions

Being innovative – the student as knowledge and is able to apply the innovation process
Competitiveness – the student shows tenacity, boldness, assertiveness and a "will to win" in dealing with highly competitive situations
Creating – the student often comes up with new ideas and is able to implement them; is able to adapt traditional methods, concepts, models, designs, technologies, or systems to new applications and is able to devise new approaches to make improvements or solve problems
Deciding – the student manages to make the right decision in complex situations
Industry and research awareness – the student Is able to follow and understand the application of new and innovative trends; has practical knowledge on new exploration and geophysics methods, including IoT and machine learning tools
Initiative – the student is able to initiate actions based on one's own interpretation or understanding of a situation
Networking – the student is able to interact with a lot of people; can do teamwork and interaction with external stakeholders
Persistence – the student is able to stay the course in times of difficulty and remain motivated to accomplish goals in the face of adversity or obstacles
Planning and organising – the student is good at estimating what's required to implement a plan
Problem solver - the student is able to solve specific industry problems (in cooperation with entrepreneurs and their real needs); is able to identify alternative solutions to a problem and to select the best option
Responding flexibly – the student is able to adapt to new situations or changing situations
Versatility – the student shows willingness to adapt to changing assignments as required

Entrepreneurship

Skills
Prepare financial statements, including a balance sheet, income statement, and cash flow statement
Basics of entrepreneurship, value creation, idea generation, opportunities, accounting, finance, technology, marketing, risk
Creating a business plan, creating a financial plan, obtaining financing, securing access to resources
Conducting market research, assessing the marketplace, marketing products and services, persuasion, getting people excited about your ideas, dealing with customers, communicating a vision

Business and operating models: more customer centric approaches, improved market forecasting and modelling, and blockchain embedded smart contracts application
Recognizing new business opportunities and developing those opportunities into new products and services
To find cost effective technologies, to maximize revenue
Core legal and economic concepts of a mineral resource project from the operator's / entrepreneur's perspective
Creating and running a business
Business and strategic planning
Customer service
Branding, marketing and networking
Intellectual Property Rights
Negotiation
Focus
Management
Leadership
How to communicate with investors and how to communicate with local community
How to communicate with legislative bodies and how to transfer information to the industry and research
Competencies
Balanced decision making – the student is objective and able to fairly evaluate the different aspects of a situation; is able to make an ethical decision that takes into account all aspects and components; is able to maintain balance between the needs of oneself, others, and the company at the same time
Competitiveness – the student shows tenacity, boldness, assertiveness and a “will to win” in dealing with highly competitive situations
Conceptual thinking - the student is able to identify and evaluate resources and plan for their utilization throughout the execution of comprehensive, long-range plans
Creativity – the student can adapt traditional methods, concepts, models, designs, technologies, or systems to new applications; can devise new approaches to make improvements or solve problems
Customer oriented – the student has a positive and constructive view of working with others, can listen to, understand and successfully work with a wide range of people from diverse backgrounds to achieve “win-win” outcomes
Developing others – the student is able to understand the needs, interests, strengths, and weaknesses of others; is able to utilize this information for contributing to the growth and development of others

Handling rejection – the student is able to handle rejection on a personal level, based solely on your self-esteem; has the ability to see yourself as valuable, separate, and apart from the role or position in life
Handling stress – the student is able to balance and defuse inner tensions and stresses; is able to appropriately separate him/herself from stressful situations and maintain own sense of inner peace
Industry life-cycle – the student understands the life cycle and the phases of a start-up company from the initial idea till a solidified company.
Initiative – the student is able to initiate actions based on one's own interpretation or understanding of a situation
Leading others – the student is able to organize and motivate people to get things accomplished in a way that everyone feels a sense of order and direction
Persistence – the student is able to stay the course in times of difficulty and remain motivated to accomplish goals in the face of adversity or obstacles
Persuading others – the student is able to persuade others, to present one's viewpoint in such a way that it is accepted by others
Proactive thinking – the student is able to evaluate future implications of current decisions and action; is able to mentally create the scenarios and outcomes of situations that could develop from decisions or plans of action
Project and goal focus – the student can maintain the direction despite obstacles in hir/her path; is able to stay on target, regardless of circumstance
Project scheduling – the student is able to understand the proper allocation of resources for the purpose of getting things done within a defined timeframe
Quality orientation – the student is able to see details, grade them against a pre-set standard, and identify flaws

It is the role of Task 4.2 to collect an advanced list of current and future needed skills and to advance a roadmap to deliver those within TIMREX. Results will be reflected in D4.2 - Roadmap for skills and competencies implementation and the Innovation and Entrepreneurship modules will use this roadmap of skills as a base to update the skills and competencies definition and teaching.

4. Innovation and Entrepreneurship aspects

4.1 Modules targeting innovation and innovative approaches

Skills and competencies in innovative techniques and technologies targeting the value chain aspects used in mineral exploration at the field, laboratories, underground and underwater environments, will be developed by research and industry partners. Planning and development of skills will take into account 1) previous studies on the skills and competencies gaps for current and future of raw materials sector (H2020 INTERMIN, and EIT RawMaterials MOBI-US) and 2) the partners' own knowledge and experiences in their field. Here, the SME's involved in the project, which are developing new state-of-the-art innovations, will play a key role. The innovation modules will include field work and technical visits to labs to introduce the innovative techniques and technologies of mineral exploration concerning the prospecting and exploration campaigns, mining geology, and underwater observations. The innovative competencies of students will be complemented by mentoring thesis works and student research work during M2 by INESC TEC and UGR.

Innovation-related aspects for the modules:

1) Skills in innovative mineral exploration techniques and technologies used in the field, in laboratories, in an underground and underwater environment will be provided to students and are seen as essential as part of the Innovation aspects.

2) T-shaped mineral explorers will use Industry 4.0 derived tools and methods for mineral resource exploration, mentored by experts, which is a good precondition to become a competent person under CRIRSCO, based on entrepreneurial competencies.

3) Field activities will give practical skills to students in field-based observation, analytical and geophysical tools, mapping, mining geology as well as underwater (seabed, flooded mines) tools of exploration, which strongly contribute to their innovative and entrepreneurship competencies.

4) Essential components to foster innovation skills based on the fieldwork section include 1) strong fieldwork-based practical training to implement innovative mineral exploration technologies applied in greenfield and brownfield mineral occurrences, 2) solid theoretical

background for completion and management of exploration campaigns and 3) process and interpret the field- and laboratory-derived data with the industry-accepted software.

5) Fieldwork is planned for around 7-8 weeks of the summer period for the students at exploration camps in Sweden and Hungary and as internship at companies.

6) The boundary-crossing competencies in the T-shaped professional model will be covered by skills in innovative techniques and technologies used in mineral exploration at the field, laboratories, underground and underwater environment. These experiences will provide the floor to innovation and entrepreneurial competencies for the students and could lead to start-up activity, make the graduates valuable specialists to junior, service, and major companies.

7) Students will have the opportunity to be in direct contact with SMEs and research institutes which work on equipment and methodology development for exploration activities. Students with specific interest towards equipment development or programming, will have the opportunity to specialize in one of these fields, working with research groups and start-ups to develop sensors, portable analytical equipment (in-hand or drone-based) or data processing and visualizing software.

4.2 Modules targeting entrepreneurship and entrepreneurial approaches

Entrepreneurship skills will be provided by TIMREX as part of its Pillars approach and with the necessary integration of its research and industry partners. Similar to the modules focusing on innovation, this task will use the consortium's knowledge and experience to draft the entrepreneurship modules. Among others, this task will 1) use EFG's mentoring programme to develop entrepreneurial and other specific skills (planned as a compulsory course as part of WP5), 2) use results and the acceleration programme of the TrainESEE v.2 project to enhance the competencies of the teaching staff of the partnering universities, 3) mentoring offered by the Academic Entrepreneurship Incubator at WUST, 4) a tool for development of innovative and entrepreneurial mindset of the students based on the Hackathon programme (help from UNIZG-RGNF via Adria Hub), 5) teaching and mentoring offered by the research and industry partners. Students will also be directed to early-stage business model development courses (pre-jumpstarter activities) and annual EIT Jumpstarters with the involvement of EIT and EIT RawMaterials.

Entrepreneurship-related aspects for the modules:

1) One of the major career paths for graduates from TIMREX shall be to join an SME-size junior company, or – completing further conditions also in the future – to become independent qualified persons under the CRIRSCO requirements.

2) Use of the EFG's mentoring programme to develop entrepreneurial and other specific skills necessary for future certified geologist experts. The EFG mentoring is planned as a compulsory course as part of entrepreneurship skills development.

3) TIMREX comprises additional competence development activities focusing on innovation and entrepreneurship, targeting the fulfilment with EIT OLOs using the help of SMEs and research institutes

4) Graduates from the TIMREX programme will be trained to become independent geologist experts by the mentoring program, founders of start-up and junior companies. Cooperation with start-ups and competence development of the students in relation with start-ups for the TIMREX project is a key objective.

5) The prospecting phase of the mineral exploration value chain is completed primarily by junior companies or freelanced experts who can be considered as start-up companies, requiring enhanced entrepreneurial skills from the employees. At different stages of the exploration value chain, companies use specific services such as drilling, borehole geophysics, areal geophysics, drone use, data processing, analytics etc., which are provided by small companies and – especially offering novel technologies and solutions – by start-ups. Students will have the opportunity to learn from and work with start-ups and service companies as the UGR and Geolgold Kárpátia.

6) To achieve a healthy mining industry, the number of activities in the prospecting phase should increase, which needs a stronger presence of junior companies and young, freelanced mineral explorers with entrepreneurial skills and theoretical basis and practical skills to complete exploration activities, applying innovative techniques and technologies.

4.3 Project-related aspects

When building the Innovation and Entrepreneurship modules for TIMREX, it will be necessary to take into account a few project level aspects, that add to the considerations that shall be given towards innovation and entrepreneurship specific modules, influencing both of them. These include:

1) Innovation and entrepreneurship competencies will follow a modular system, complementing the semester courses and partly given by intensive fieldwork modules.

2) Intensive fieldwork during the summer period between M1 and M2 academic years. This will be a specialty of the TIMREX programme and comprises a much more intensive joint education activity compared to other labelled programmes. 7-8 weeks of the summer period is scheduled as fieldwork for the students at exploration camps in Sweden and Hungary and as internship at companies.

3) Entrepreneurship, innovative and socio-civic skills will be developed by the third pillar, intensively using the EFG's mentoring programme and SME and RTO partners of the consortium. The third pillar comprises additional competence development activities focusing on innovation and entrepreneurship, targeting the fulfilment with EIT OLOs using the help of SMEs and research institutes.

4) The boundary-crossing competencies in the T-shaped professional model will be covered by skills in innovative techniques and technologies used in mineral exploration at the field, laboratories, underground and underwater environment. These experiences will provide the floor to innovation and entrepreneurial competencies for the students and could lead to start-up activity, make the graduates valuable specialists to junior, service, and major companies.

5) Cooperation with start-ups and competence development of the students in relation with start-ups for the TIMREX project is a key objective.

6) SMEs, start-ups' role: SMEs contribute to the project by proposing thesis works, to teaching as invited speakers, contribute to the teaching of entrepreneurship.

7) Research institutes' role: The role of the research institutes is to contribute to the project by mentoring the curriculum development, proposing thesis works, supervising student research and development activities that can lead to achieving the EIT HE 5.1 core KPI, contribute to

teaching as invited speakers, contribute to the teaching of entrepreneurship and of social licence to operate issues.

4.4 Possibilities offered by the TIMREX innovation and entrepreneurship approach

As an education project which involved elements from all sides of the Knowledge Triangle, the TIMREX's Master's approach offers benefits and possibilities for stakeholders who want to be directly involved with the project implementation actions. Some of these possibilities and benefits are:

Possibilities for students: One of the major career paths for graduates from TIMREX shall be to join an SME-size junior company, or – completing further conditions also in the future – to become independent qualified persons under the CRIRSCO requirements.

Possibilities for teachers: academic staff will receive trainings on relevant competencies such as teaching methods of entrepreneurial skills, on science to business models which will directly be used for the teaching.

Possibilities for geoscientific professionals: Offering the specific innovation and entrepreneurship modules and approach, the program might be attractive for mid-career mineral explorers from different parts of the world who already have several years practice and would like to develop their capacities towards to become freelancing exploration experts.

Possibilities for companies: To achieve a healthy mining industry, the number of activities in the prospecting phase should increase, which needs a stronger presence of junior companies and young, freelanced mineral explorers with entrepreneurial skills, theoretical basis and practical skills to complete exploration activities, applying innovative techniques and technologies.

4.5 Innovation and Entrepreneurship SWOT analysis

Table 2: SWOT analysis of the Innovation and Entrepreneurship aspects related to TIMREX

Strengths	Weakness
Unique blend of education, research and industry partners	Innovation and entrepreneurship theoretical teaching is often ineffective

Teaching methodology that consists on three main areas: courses, fieldwork and mentorship Industry and research partners developing and using innovative technologies and approaches Experienced raw materials experts that can mentor students Partners knowledge on current and future needed skills and competencies Partners knowledge on innovation and entrepreneurship teaching and ideation	The three pillar teaching might be too limited, which would require the inclusion of other measures
Opportunities	**Threats**
Obtaining the EIT Masters label Support from EIT RawMaterials Supporting and endorsement of partner universities and other universities in the ESEE region Involve more research and industry partners during implementation	Innovation and Entrepreneurship are difficult to define Competition from other Master's programmes offering skills and competencies in the same areas Lack of interest in the Master's from students on these skills Double degree and joint degree might not function well for teaching/delivering skills and competencies Lack of time to properly define innovation and entrepreneurship skills and competencies that will be needed in the future

5. Innovation and Entrepreneurship concepts' link to EIT Label

Innovation and entrepreneurship-related skills and competencies are a focus of EIT and its KICs, such as EIT RawMaterials. The focus on the so-called Knowledge Triangle brings the concepts of Innovation and Entrepreneurship to light with support of research and industry partners, complementing Education-based learning. The KICs' higher education partners focus on building upon existing excellence in education to provide students, entrepreneurs and business innovators with the knowledge, competencies and skills necessary for an economy of knowledge and an entrepreneurial, sustainable society.

TIMREX is pursuing the EIT Label for its degree programme. This will grant it a unique brand, one that shows clear alignment, among other aspects, with innovation and entrepreneurship in and for the raw materials sector. Therefore, it is necessary to employ mechanisms and pathways that can clearly show the support for innovation and entrepreneurship skills and competencies (which shall be in accordance with the EIT Label framework and its Quality Assurance and Learning Enhancement principles). In its own words, the EIT Label is "a certificate of quality education in entrepreneurship and innovation", which again reinforces the necessity of having these components in the teaching process.

Furthermore, it is necessary for the Innovation and Entrepreneurship focus to contribute to the EIT Overarching Learning Outcomes (OLOs). TIMREX's three pillar approach – courses, fieldwork and mentoring, where innovation and entrepreneurship are relevant – certifies that its Master's contributes to the relevant OLOs and Key Principles. The following table (Table 2) compiles pathways that TIMREX will use to reach the OLOs. TIMREX will also take into consideration Intended and Achieved Learning Outcomes regarding innovation and entrepreneurship-related skills and competencies.

Table 3: EIT OLOs and how TIMREX relates to them (focus on Innovation and Entrepreneurship).

EIT OLO 1 - Entrepreneurship skills and competencies	
Definition	TIMREX's approach

The capacity to identify and act upon opportunities and ideas to create social, cultural and financial value for others, including translating innovations into feasible business solutions, with sustainability at their core.	TIMREX will make strong use of fieldwork (at mining areas, supported by industry partners, visits to research centres) with high technological input from research and industry exploration companies, which will show students how innovative prospects can be created to generate value for the raw materials value chain. The business ideation and creation process of partner companies will be used to provide entrepreneurial skills. During the mentoring programme, students will be able to learn how to bring ideas into business creation from business experts and will be offered organisational support to kick-start their own ideas. With individual and team exercises done during the modules, students will acquire entrepreneurial skills and competencies and be able to showcase those within a series of exercises.

EIT OLO 2 - Innovation skills and competencies

Definition	TIMREX's approach
The ability to formulate knowledge, ideas and technology to create new or significantly improved products, services, processes, policies, new business models or jobs, and to mobilise system innovation to contribute to broader societal change, while evaluating the unintended consequences of innovation and technology.	Within TIMREX classes, innovation elements will be included in the teaching methodology, including teaching on innovative methodologies and the innovation process. This will be complemented by the fieldwork aspect, where students will be able to see, learn and use innovative technologies developed by research and industry partners in a hands-on approach. The mentoring programme will focus on supporting development of knowledge and ideas for innovation creation.

EIT OLO 3 - Creativity skills and competencies

Definition	TIMREX's approach

The ability to think beyond boundaries and systematically explore and generate new ideas.	TIMREX classes will include activities that will facilitate creativity development and use through exercises such as presentations. Research partners will showcase how to analyse the horizon and unblock the potential for future/innovative research through creative thinking. The mentoring programme will support students in their creativity process in support of innovation and entrepreneurship creation.

EIT OLO 4 – Intercultural skills and competencies

Definition	TIMREX's approach
The ability to engage and act internationally and to function effectively across cultures, sectors and/or organisations, to think and act appropriately and to communicate and work with people from different cultural and organisational backgrounds.	TIMREX will offer a strong intercultural component. Classes will be taught in English and are expected to include ESEE students and international students alike, with adapted innovation and entrepreneurship concepts. Visits to the research partners, as well as the fieldwork (with social programs) in Europe will foster contact and interaction with different people and cultures. Through the mentoring programme, students will have the chance to engage with geologists and geoscientific entrepreneurs from Europe. This will force students to communicate and engage to a wide range of groups.

EIT OLO 5 - Making value judgments and sustainability competencies

Definition	TIMREX's approach
The ability to identify short- and long-term future consequences of plans and decisions from an integrated scientific, ethical and intergenerational perspective and to merge this into a solution-focused approach,	Research and industry partners will "tell their story" – how and why they were created, how they adapted to changing conditions (e.g., push for sustainability), their current and future plans and how they are planning to monitor and adapt them; this will showcase part of the innovative and entrepreneurial processes. The mentoring programme will offer students a birds-eye view on several decisions within the raw materials value chain and how they led to new solutions, based on scientific, ethical and intergenerational inputs. Classes will include exercises that require students to act/make decisions

moving towards a sustainable and green society.	upon sustainability principles linked to Innovation and Entrepreneurship.

EIT OLO 6 - Leadership skills and competencies	
Definition	**TIMREX's approach**
The ability of decision-making and leadership based on a holistic understanding of the contributions of Higher Education research and business to value creation, in limited sized teams and contexts.	Students will learn from research and industry partners the decision-making and leadership process and necessary skills to be a leader in the raw materials panorama. During lectures and field work, group exercises will facilitate the development of leadership-related skills and competencies such as organisation, communication and time management.

Then, TIMREX will also consider the Key Principles for EIT Degree Programmes when designing the Innovation and Entrepreneurship modules under the following scope:

1) **Knowledge Triangle Integration:** Education, Research and Industry partners are part of the TIMREX project and they all contribute to design and implement learning modules and will all be providing precious input to the learning methodology under the three pillars. Within the three pillars that include innovation and entrepreneurship teaching, societal challenges will be on focus (e.g., raw materials dependence, moving towards a sustainable economy, delivering the Green Deal, and others).

2) **Innovation & entrepreneurship education:** TIMREX will have a transversal focus on Innovation and Entrepreneurship skills and competences development (the target of WP4) in support of the EIT Label for Master's programmes. Throughout several formats of engagement with students – classes, fieldwork, mentoring – it is expected that students can develop their entrepreneurial mindset and capacity of innovation from real examples (e.g. new exploration technology of the start-up UGR). Innovation skills teaching will comprise novel exploration methods, while entrepreneurship will focus on the process from ideation to business. The

final outcome is for students to be able to transform scientific expertise into tangible societal solutions, supported by the Knowledge Triangle partners.

3) **Highly integrated, innovative learning-by-doing curriculum:** The research and industry partners will showcase their innovation and entrepreneurship process to provide students with unique inputs regarding these topics. Some actions/activities - use of technology and services, others – will provide a hands-on and a learn-by-doing approach. Students will work individually or as teams throughout the three teaching pillars on different exercises and activities. One essential complementary component for this Key Principle is the integration of a problem proposed by one of the industry partners, where students need to find a solution for.

4) **International engagement and mobility experience:** TIMREX will offer strong international engagement and mobility experiences to the students. For example, the mobility of students between partner universities, mobility to fieldwork and summer school and mobility to visit research and industry partners facilities will all be used to render Innovation and Entrepreneurship skills and competencies to the students. These aspects also apply to fostering international engagement, where students will be able to engage with professionals from Europe and beyond.

5) **Inter-sectoral and inter-organisational experience:** Fieldwork, mentoring and internships in research and industry partners premises will support organisational mobility for the students.

6) **Geographic inclusion:** The TIMREX programme is centred around 3 universities of the ESEE region, one of the regions that are embedded in the EIT Regional Innovation Scheme. Innovation and Entrepreneurship teaching will be added with the support of partners from this and other regions (Sweden, Spain, Hungary, Slovenia and others). Furthermore, it is expected that students from different countries will participate in the TIMREX Master's.

7) **Inclusion, diversity and gender mainstreaming and equality:** Teaching of innovation and entrepreneurship skills and competencies will address the current and anticipated skill shortages and demographic changes, as well as the underutilisation of the skills and competencies of women, thus supporting diversity and gender equality. All activities will take these principles into account.

Last but not least, preparation of Innovation and Entrepreneurship skills and competencies will be defined in such a way that all the following questions on *Qi2.4 INNOVATION AND ENTREPRENEURSHIP EDUCATION AND INTERDISCIPLINARITY* from the EIT Label Handbook can be answered positively:

1) Q2.4.1 Are students exposed/actively offered an access to the KIC's or university-based innovation and entrepreneurship ecosystem, including technical, financial and human services (incubators, mentoring and coaching, seed funding etc.) in order to develop their entrepreneurial skills and competencies and to test out the commercial potential and viability of their ideas/learning/research outcomes?

2) Q.2.4.2 Does the programme provide students with information and guidance on intellectual property rights (IPR) aligned with the respective (inter)disciplinary field?

3) Q2.4.3 Does the programme have a continuous improvement plan in place to support instructors covering e.g. training, shared learning or continuous professional development in the area of I&E education?

4) Q2.4.4 Does the programme adopt inter-/transdisciplinary approaches and bring together science/technology/knowledge in order to address broad societal and global challenges and/or link up with new business and innovation processes?

There are more aspects regarding the EIT Label process application. However, this chapter only makes the connection between Innovation and Entrepreneurship in TIMREX and the many aspects of the EIT Label. The Labelling procedure is further detailed on WP2 and WP3, thus complementing the information developed on this deliverable and WP4 as a whole.

6. Relation of the Strategic implementation of innovation and entrepreneurship to the achievement of KPIs

The implementation of the TIMREX project considers both EIT Core KPIs as well as KIC specific KPIs, for a total of six different KPIs.

For the EIT Core KPIs, the following measurable targets are considered:

1) EITHE05.1: Startups created by students enrolled & graduates from EIT-labelled programs. This KPI measures the "number of start-ups established in year N by students enrolled and graduates from EIT labelled MSc and PhD programmes or by learners/participants in other EIT labelled activities".

    a) Relation and contribution of this deliverable to EITHE05.1: This deliverable defines the strategic approach that the project will take towards teaching and implementation of Innovation and Entrepreneurial concepts. These are seen as two of the most important groups of skills needed to create start-ups. The TIMREX strategic approach provides students with tools that will allow them to create their own companies (e.g. adding skills and competencies on entrepreneurship and innovation, Learning from Knowledge Triangle stakeholders, etc.). Despite not contributing directly to the KPI, this deliverable will facilitate it.

2) EITHE07.1: Graduates from EIT-labelled programmes. This KPI measures the "Sum of graduates from EIT labelled master's, PhD programmes and other education activities awarded EIT Label (in year N).".

    a. Relation and contribution of this deliverable to EITHE07.1: Innovation and Entrepreneurship concepts are essential part of the TIMREX EIT Labelled programme, and thus are mandatory for each student to complete courses and be exposed to them. This deliverable, therefore, contributes to a small part of the whole of TIMREX, as a whole, that will contribute to having graduates from the programme.

3) EITHE09.1 (21-22): Students and graduates from EIT labelled MSc and PhD programmes who joined start-ups. This KPI measures the "Number of students (per country) who joined start-ups during their EIT Label MSc and PhD studies. Sum of EIT Label graduates who joined start-ups up to 3 years after graduation."

    a. Relation and contribution of this deliverable to EITHE09.1: This deliverable considers several instruments, as part of the TIMREX curricula, that students can make use of, to join start-ups during the Master's period (). A few examples include 1) tasks on solving specific industry problems (in cooperation with entrepreneurs and their real needs) and interaction with external stakeholders, 2) real-work impressions/shadowing at the mentor's place of work (if possible) when implementing mentorship actions, 3) possibility to do short internships at partner research and industry institutions where students can have a hands-on approach on innovation and entrepreneurship, and 4) use a scholarship via RIS Internship programme.

    b. Besides the above, the following also help and contribute to TIMREX graduates joining start-ups after graduation: 1) Preparation of a business plan/idea as part of a course, 2) having companies presenting on the industry's future, needs, requirements, and lessons learned from the past, with the possibility of questions and answers sessions, 3) the TIMREX summer school, 4) participation in field missions (under the scope of ongoing projects and activities), 5) participation in national and international projects, and 6) Participation of students in national, European and international challenges; e.g., PDAC Next generation explorers Award challenge, SEG Evolve challenge.

For the KIC Specific KPIs, the following measurable targets are considered:

1) KICN01-11: Improve gender balance in the RM sector. This KPI measures the "Relative number (value between 0 and 1) of women graduating from courses that are related to raw materials (incl. summer schools, individual courses, lifelong learning, PhD & Master EIT labelled programs)".

    a. Relation and contribution of this deliverable to KICN01-11: The innovation and entrepreneurship strategy and its actions (e.g. internships, mentoring, etc.) are

designed to consider the inclusion of more women in TIMREX activities. This will anchor women in the raw materials-related education and raw materials sector activities, thus contributing to improving gender balance in the raw materials sector.

b. Entrepreneurial-related actions are even more important in this sense, since creation and running of raw materials companies can be easily done by women (instead of a more physically demanding mining job), further guaranteeing the achievement of this KPI.

2) KICN02-07: Students in Master Education short courses. This KPI measures the "Number of MSc students that completed a RM-related short courses (Summer school, winter school, individual courses, etc.)".

   a. Relation and contribution of this deliverable to KICN02-07: Innovation and Entrepreneurship are main components of the TIMREX Summer School. They contribute to students in the TIMREX Masters to complete this action.

3) KICN02-10: Students & Industry - Knowledge Triangle Integration. This KPI measures the "Number of students exposed to industry as part of a KAVA project (participating in upscaling projects, doing internships for a project, in open innovation events, etc.)".

   a. Relation and contribution of this deliverable to KICN02-10: The Innovation and Entrepreneurship concepts of TIMREX have at their core the integration of students with the knowledge triangle (research and industry), especially thanks to activities such as mentoring, internships and participation in national and international projects, with project partners. All students of TIMREX will be exposed to industry with these activities.

7. Conclusions of the Strategic plan

7.1 Timeline and considerations for implementation of modules and delivering skills and competencies

First year components:

- Curriculum development will comprise a crucial part of the tasks in the first year of the project. It should be based on the criteria for EIT labelling and should focus on finalizing the joint program. Another, subsequent major issue of curriculum development is the improvement of course contents and education methods to fit the labelling criteria. For the TIMREX joint labelled programme, the modular model of labelling is realistic, based on mobility schemes of joint education and incorporating jointly organized and conducted modules that focus to achieve the EIT OLOs.
- Intensive fieldwork during the summer period between M1 and M2 academic years. This will be a specialty of the TIMREX programme and comprises a much more intensive joint education activity compared to other labelled programmes. 7-8 weeks of the summer period is scheduled as fieldwork for the students. The field camps will introduce the innovative techniques and technologies of mineral exploration concerning the prospecting and exploration campaigns, mining geology, and others, which will strongly contribute to OLO1, OLO2, OLO3 – entrepreneurship, innovation and creativity skills of the students.
- Additional competence development focusing on overarching learning outcomes on the attitude and responsibility-type competencies of the students: innovation, creativity, social responsibility and sustainability, entrepreneurship, thus to OLO1, OLO4, OLO5, and OLO6 – Entrepreneurship, intercultural, sustainability, and leadership skills of the students. Entrepreneurship skills are especially important for graduates to join an SME-size junior company, or – completing other requirements also in the future – to become independent qualified persons under the CRIRSCO requirements. The TIMREX project will intensively use the EFG's mentoring programme to develop entrepreneurial and other specific skills necessary for a future certified geologist expert. The EFG mentoring is planned as a compulsory course as part of the entrepreneurship skills development. Results and the acceleration programme of the TrainESEE v.2 project will be used to enhance the competencies of the teaching staff of the partnering universities, helping to work out entrepreneurship modules embedded in the professional courses of the TIMREX curricula.

- Innovative competencies of students will be developed by mentoring thesis works and student research work during M2 by INESC TEC and UGR. These activities will involve students in exploration technique development derived from research projects such as UNEXMIN, UNEXUP, ROBOMINERS, ¡VAMOS!. In parallel, students will be mentored by the Academic Entrepreneurship Incubator at WUST. UNIZG-RGNF via HUB ADRIA is managing Hackathon programme which will be linked to TIMREX as a tool for development of innovative and entrepreneurial mindset of the students. Students will also be directed to early-stage business model development courses (pre-jumpstarter activities) and annual EIT Jumpstarters.
- Following the modular model of the label criteria, 15 ECTS should be dedicated to innovation and entrepreneurship learning outcomes, and additionally other OLOs should be fulfilled. For this purpose, horizontal modules are planned as:
    - 2.5 ECTS in the second semester; (fundamental course on I&E, can be organized as a joint online course with project-based exercise),
    - 5 ECTS during the summer field work; (innovative mineral exploration methods)
    - 7.5 ECTS in the third semester. This block shall include the „Exploration Entrepreneurship" course conducted with the assistance of the EFG, joining the students in the EFG's mentoring program and elective courses with I&E activities (e.g. sensor technology development and application, 3D, 4D visualization of exploration data). The „Exploration Entrepreneurship" course is an important add-on module taught as a joint online course with involvement of active field geologists and the experts of the EFG.
    - 2-2.5 ECTS in the fourth semester for socio-civic competencies. It will be completed by joining the IN4SOC network and completing a SOC internship in line with the thesis preparation internship/period.

Following years' components:

- Developing skills and competencies of the students in innovative mineral resource exploration, applying newly developed equipment and methods such as portable analytical equipment (XFR, LIBS) and drone-based surveying solutions using different spectral ranges.
- Curriculum development tasks to streamline the curricula towards Lighthouse goals will be coordinated by the WUST, while specific aspects of this such as mentoring and SOC competence (WP5), innovation and entrepreneurship (WP4) WPs are governed by the EFG and the LPRC, respectively.

- The preparation for conducting the entrepreneurship and innovation modules and for the mentoring task, which comprises one of the crucial parts of the entrepreneurial skills development.
- Another specific task of H1 2023 is the development of innovation and entrepreneurship modules. Master 1 (first year) program includes one introductory course on innovation and entrepreneurship, while the third semester will have an extended module with I&E content. In the frame of this module, an "exploration entrepreneurship" course will take place with the intensive help of the EFG, giving direct experiences about practice of an exploration private expert or team worker of a junior company, under the umbrella of the EFG's existing mentoring program. The I&E module in the third semester comprises 7.5 ECTS.
- The summer field period will also be used for specific internship for those students who are interested in exploration equipment development, focusing on spectroscopic sensor development, robotization, underwater exploration technologies. These students will complete the internship period at SME and research partners such as UGR, m, KGHM Cuprum, GeoZS or at the UM with specific help from Faculty of Mechanical Engineering and Informatics. These students will be mentored in the Master 2 year to gain competencies to be able to join start-ups and to take part in the Jump-starter program or similar talent-developing actions (e.g. Hungarian Startup University Program at the UM, Academic Entrepreneurship Incubator at the WUST).

Besides the already defined plans defined in the two previous points, TIMREX education participants are expected to extend to innovation and entrepreneurship-related teaching by making use of complementary actions. Sub-chapter 3.3 lists several options that can be (some more than others) easily implemented, that require involvement with the Knowledge Triangle and that make use of digital tools and available programmes and competitions.

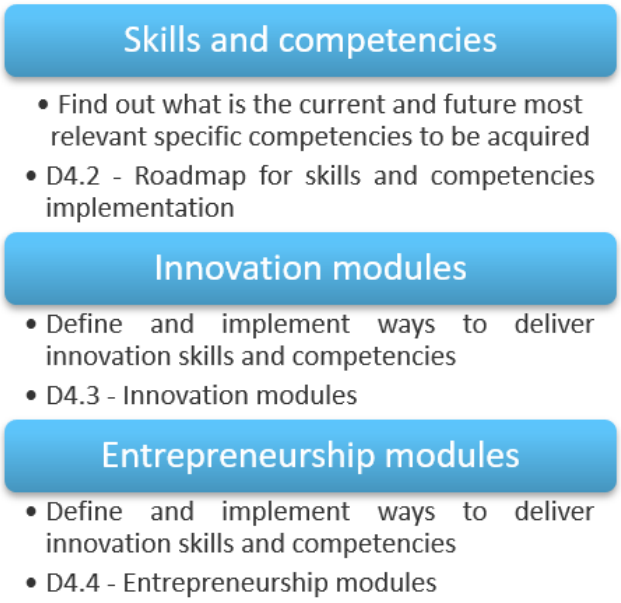
Furthermore, partners shall start planning modules with the list of innovation and entrepreneurship-related skills and competencies listed in sub-chapter 3.5 in mind. This list will be further adapted in correlation with D4.2.

7.2 Next steps

As laid down in this strategic document, the TIMREX consortium already has a good plan and corresponding definitions for the implementation and management of the innovation and

entrepreneurship-related aspects that can be offered as part of its Master's. In this sense, the next step will include the study and elaboration of the stock of current and future skills and competencies that are and will be in demand by the raw materials industry (focus on Innovation and Entrepreneurship-related ones). This will provide an updated list of skills that will be included in the modules planning and teaching elements (if they are not already considered; e.g., the list already provided in this document). Deliverable 4.2 will contain the list of skills and competencies that should be offered, which partner can offer them and how/which format they will be provided.

After this data collection and processing and the development of the roadmap, TIMREX will iron out the Innovation and the Entrepreneurship modules to be offered, adapting skills and competencies according to this document, the updated list of skills and any new findings provided by the consortium or EIT RawMaterials. Deliverables 4.3 and 4.4 will detail the development of the Innovation and the Entrepreneurship modules, respectively.



Research and Industry partners will be collaboratively engaging in the development of modules to support the education partners in providing the necessary skills and competencies. Monitoring of the progress will be done by the leader of the WP jointly with the Coordinator and the Steering Committee members to guarantee that the approach is up-to-date.