



SOFTEN Framework for the integration of green soft skills in STEM education

suomenkielisellä tiivistelmällä

Työpaketti 2
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Suomenkielinen tiivistelmä

Hyvä lukija

Ilmastokriisi ja muut megatrendit, kuten globalisaatio, digitalisaatio ja siirtyminen vähähiiliseen talouteen, muokkaavat ja muuttavat myös kommunikoinnin ja työn tekemisen tapoja työympäristöissä. Uusien taitojen kehittämistä vihreitä työpaikkoja varten pidetään kriittisenä tekijänä, jolla varmistetaan, että työmarkkinoilla oleva osaaminen omalta osaltaan tukee vihreää siirtymää (Global Deal, 2023).

SOFTEN-hankkeen (www.softenproject.eu) keskeisenä lähtökohtana on, että teknisen ja luonnontieteellisen osaamisen ohella tarvitaan ns. pehmeitä taitoja ('soft skills'; esim. kommunikointi ja vaikuttaminen, ihmisten johtaminen, ongelmanratkaisutaidot, yms.). Toisena lähtökohtana on, että näiden taitojen rooli on perinteisesti ollut vähäinen STEM-aloilla (luonnontieteet, tekniikka ja insinööritieteet, matemaattiset aineet), ottaen huomioon että niiltä valmistuu suuri osa vihreän sektorin työntekijöistä, erityisesti esimiehistä.

Vihreään talouteen siirtyminen edellyttää *"osallistavaa ammattitaidon vallankumousta, jossa kaikki työntekijät ovat mukana kaikilla pätevyys- ja virkaiältään korkeammilla tasoilla, aloilla ja ammateissa"* (Cedefop, 2023). Oppilaitosten ja vihreiden yritysten rooli on ratkaiseva ekologisessa muutosprosessissa, sillä vihreällä siirtymällä on suuri vaikutus työmarkkinoiden tämänhetkisiin tarpeisiin (Cedefop, 2023).

Tämä väliraportti on SOFTEN-hankkeen ensimmäisen työpaketin tulos. Se koostuu käsitteellisestä määrittelystä, kirjoituspöytätyöstä sekä useista kysely- ja haastattelututkimuksista. Näiden toimien ensisijaisena tavoitteena on kiinnittää STEM-alojen oppilaitosten ja vihreän teollisuuden sidosryhmien huomio pehmeiden taitojen ratkaisevaan rooliin osana vihreää siirtymää. Tutkimuksen päätavoitteena oli ymmärtää paremmin tärkeimpiä suuntauksia ja mahdollisuuksia STEM-korkeakoulutusalueella ja syventyä kuuden Euroopan maan vihreiden yritysten tarpeisiin.

Tässä lyhyessä suomenkielisessä tiivistelmässä esitellään

- STEM-kouluttajien, opiskelijoiden ja vihreiden edustajien nykyinen tietoisuus pehmeiden taitojen käsitteestä sekä niiden roolista ja suhteesta vihreään osaamiseen ja vihreään siirtymiseen.
- Pehmeiden taitojen kehittämistarpeet ja -aukot STEM-alojen koulutusohjelmissa ja vihreän talouden eri aloilla.
- Näiden taitojen opettamista edistävien tekijöiden tunnistaminen STEM-opetussuunnitelmissa.
- Oppimismenetelmiä ja hyviä käytäntöjä pehmeiden taitojen kehittämiseksi yliopistoissa ja vihreän talouden yrityksissä.

Koko englanninkielinen väliraportti koostuu seuraavista osista:

- SOFTEN-hankkeen ja sen odotettujen tulosten esittely
- Työpakettien 2 tärkeimmät toimet ja puitteiden tavoite
- Pehmeiden taitojen määritelmä, vihreä siirtymä ja kehitetyt typologiat
- Tutkimuksen taustatiedot

Tutkimustulosten ohella raportissa esitetään tutkimuksen johtopäätöksiä ja kokemuksia, yksityiskohtainen kirjallisuusluettelo, joka sisältää kaikki käytetyt verkkolähteet kustakin kolmesta luvusta, sekä viisi liitettä, mm. osatutkimuksia varten suunnitellut raportointimallit ja laadittu haastatteluopas.

Kerätyn aineiston perusteella näyttää siltä, että pehmeät taidot ovat tulossa ratkaisevan tärkeiksi monilla aloilla ja erityisesti STEM-opiskelijoiden uran ja ammatillisen kehityksen edistämiseksi. Vaikka tutkimus anoi viitettä siitä, että nämä taidot on yleisesti tunnustettu ja niitä pyritään jossain määrin kehittämään niin oppilaitoksissa kuin yrityksissä, niiden yhteyttä vihreään siirtymään ei ole tutkittu kovinkaan paljon osallistujamaissa. Samaan aikaan nykyiset haasteet (esim. useiden luonnontieteiden ja tekniikan alan opinto-ohjelmien perinteinen rakenne, opettajien puutteelliset taidot ja valmiudet kouluttaa tällaisia taitoja sekä luonnontieteiden ja tekniikan alan opiskelijoiden keskinkertainen tietoisuus pehmeiden taitojen yhteydestä ja niiden roolista vihreässä ammatissa) aleviivaavat tekniikan koulutusaloille kohdistuvaa lisätoimien ja -strategioiden tarvetta. Lisäksi määrätietoiset ratkaisut puuttua pehmeiden taitojen puutteisiin vaihtelevat maasta toiseen riippuen sidosryhmien tarpeista ja kiinnostuksesta kansallisella tasolla. Kunkin maan erityispiirteiden lisäksi tutkimuksen tulokset ehdottavat nykyisten STEM-opinto-ohjelmien tarkistamista sekä pätevyysvaatimusten ja koulutusmahdollisuuksien parantamista.

Vajavainen panostus pehmeiden taitojen kehittämiseen STEM-aloilla on tekijä, joka heikentää opiskelijoiden työelämäkelpoisuutta. Siksi johdonmukaiset ja tulevaisuuteen suuntautuvat STEM-opetuksen opetussuunnitelmauudistukset sekä julkisen ja yksityisen sektorin kumppanuudet taitojen ja valmiuksien kehittämiseksi ovat välttämättömiä, jotta vihreän siirtymän aloilla toimivien yritysten tarpeisiin voidaan vastata.

Yhteenvetoa

Väliraportissa esitellään tutkimus, jossa tarkastellaan nykytilannetta pehmeiden taitojen, erityisesti ympäristöpainotteisten taitojen tai "vihreiden pehmeiden taitojen", integroimisessa luonnontieteiden, teknologian, tekniikan ja matematiikan (STEM) opetussuunnitelmiin kuudessa Euroopan maassa, jotka edustavat erilaisia kulttuurisia, teknologisia, sosioekonomisia ja ympäristöllisiä olosuhteita. Määrällisten ja laadullisten tiedonkeruumenetelmien yhdistelmällä kehityksessä tunnustetaan suuntauksia, tilaa ja puutteita vihreiden pehmeiden taitojen sisällyttämisessä STEM-opintosuunnitelmiin valituissa yliopistoissa ja laitoksissa, jotka työskentelevät projektin puitteissa SOFTEN-opetusintervention toteuttamiseksi ja pehmeiden taitojen sisällyttämisestä opetussuunnitelmiinnsa kestävää vihreää siirtymää varten.

- Pehmeät taidot ovat saaneet Euroopassa yhä enemmän tunnustusta ja merkitystä koulutuskeskustelussa. Tätä vahvistaa se, että EU:n toimielimet

ovat kehittäneet lukuisia koulutusaloitteita ja -puitteita, kuten elinikäisen oppimisen avaintaitojen eurooppalainen viitekehys tai eurooppalainen kestävä kehityksen osaamisen viitekehys, jotka koskevat monialaisten taitojen merkitystä.

- Paikallisen tason osalta raportti kertoo, että kaikissa kuudessa tutkimusmaassa on tehty pienimuotoisia aloitteita pehmeiden taitojen edistämiseksi STEM-osastojen opetussuunnitelmissa. Tämä on myönteinen merkki siitä, että siirtyminen kohti integroituneempia akateemisia ohjelmia STEM-kouluissa on käynnistynyt.
- Haastattelujen perusteella STEM-alan opettajat tuntevat pehmeiden taitojen käsitteen melko hyvin kaikissa osallistujamaissa. Niiden merkitys vihreään siirtymäprosessiin on kuitenkin paljon epäselvempi. Tietoisuuden yleisessä tasossa on luonnollisesti havaittavissa vaihtelua eri maiden välillä.
- Eräs väliraportin kiehtova havainto on se, pehmeiden taitojen kehittämisen esteet STEM-opinto-ohjelmissa näyttävät olevan yhteisiä kaikissa maissa. Ne liittyvät sekä rakenteellisiin tekijöihin, kuten jäykkyyteen, joka koskee pehmeiden taitojen sisällyttämistä virallisiin ohjelmiin, että mikrotason tekijöihin, kuten vähäiseen kiinnostukseen, motivaatioon tai tietoisuuteen pehmeistä taidoista koulutuksen tarjoajien taholta.
- Pehmeiden taitojen edistämässä avaintekijä on sidosryhmien tiiviimpi ja vahvempi yhteistyö kouluttajien ja yritysten välillä. Raportissa on esitelty lukuisia toimenpiteitä tämän toteuttamiseksi.
- Vihreän teollisuuden viheralan toimijoiden tietämys pehmeiden taitojen käsitteestä vaihtelee eri maissa. Sidosryhmät arvostavat *tiimityötä, sopeutumiskykyä, viestintää, yhteistyötä, ennakkoluulottomuutta, empatiaa, kriittistä ajattelua ja ongelmanratkaisua.*
- Alan työntekijöiden puutteita pehmeissä taidoissa nähtiin mm. *luovuudessa, riskien ottamiskyvyssä ja työntekijöiden heikoissa viestintätaidoissa.*

Mielenkiintoisia lukuhetkiä!

Turun ammattikorkeakoulun SOFTEN-tiimi

DELIVERABLE INFORMATION

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Executive summary

Nowadays, the unfolding climate emergency and mega trends such as the globalisation, digitalisation and transition to a low-carbon economy are reshaping and transforming the way that young graduates and employees collaborate with each other and respond to challenges of their current rapidly changing workplace. The development of new and different competences for green jobs is considered a critical parameter for ensuring that the transition to a green economy is inclusive and fair, by matching supply and demand for skills (Global Deal, 2023). The green transition calls for an *'inclusive skilling revolution involving all workers, across qualification and seniority levels, sectors and occupations'* (Cedefop, 2023). The role of educational institutions and of green businesses is crucial in the ecological transformation process, as 'greening' the economy has a major impact on labour market needs that are currently in the spotlight (Cedefop, 2023).

This deliverable represents the first concrete result of Erasmus+ project SOFTEN. It consists of a conceptual and research-based framework that includes both theoretical knowledge and findings of sequential research activities. The primary goal behind these activities is to draw the attention of STEM academic community and of green industry stakeholders about the critical role of soft skills as part of green competences and green transformation process. Another primary objective of SOFTEN research study is to understand better the most important trends and opportunities in STEM Higher Education Area (HEA) and dive into the needs of green companies in six European countries in relation to the following topics:

- Current level of awareness from the side of STEM educators, students and green representatives on the concept of soft skills as well as their role and relation with green competences and green transition.
- Needs and gaps on soft skills' development within STEM academic programmes and across a diversity of green economy sectors.
- Identification of driving factors for soft green skills promotion and development in STEM curricula.
- Initiatives and good practices on soft skills development in universities and green economy entities.

The framework is divided into the following chapters:

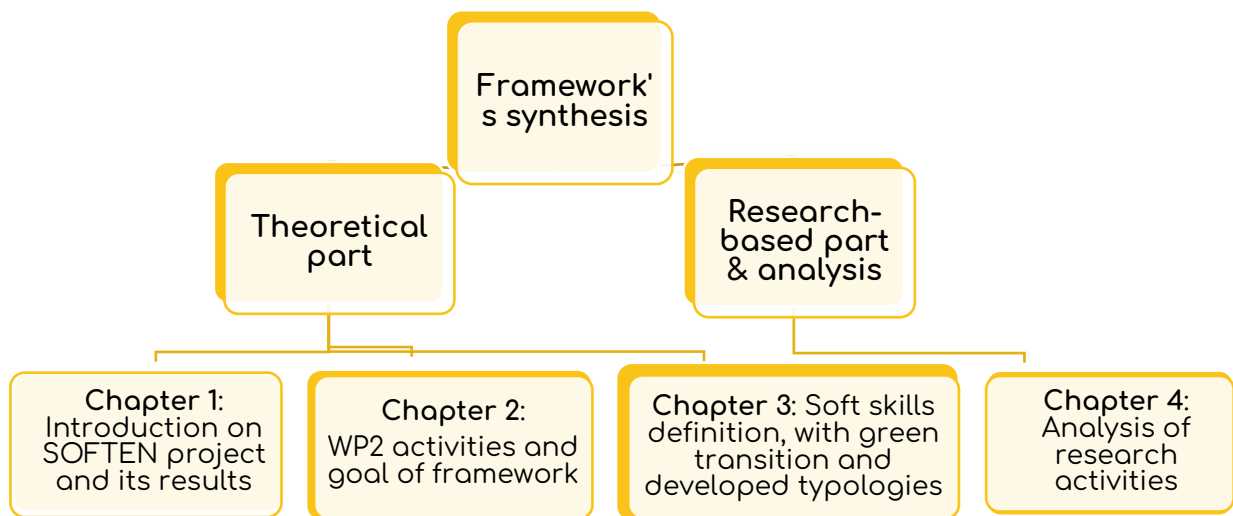


FIGURE 1. STRUCTURE OF SOFTEN FRAMEWORK

Following the main analysis of research findings, the report provides a summary of conclusions and lessons learnt from the whole study, a detailed bibliography with all used online sources from each chapter and five Annexes, including the reporting templates that were designed for each research activity and the developed interview guide.

Considering all mapped trends and collected opinions that are presented in detail in Chapter 4, it seems that soft skills are becoming critically important for many fields and especially for the advancement of STEM students' green career and professional development. Notwithstanding the application of relatively limited and scattered initiatives on soft skills' development recorded at university level and as part of some green companies' operation, the connection of these 'transferable' skills with green transition is not explored that much in the participating countries. At the same time, existing challenges (e.g., traditional structure in several STEM curricula, lack of educators' competences and capacity to perform trainings on such skills and the medium-level awareness of surveyed STEM students for the connection of soft skills and their role to green profession) underline the necessity for additional steps and strategies that need to be adopted by the technical academic programmes. In addition, organised solutions and effective pathways to tackle soft skill shortages and gaps vary from one country to another, depending on stakeholders' needs and interest at national level. Apart from each country's particularities, the study's results call for a revision of existing STEM academic curricula and an improvement of qualification standards and training opportunities.

As skills shortages persist and the low level of STEM educators' capacity building in interdisciplinary methods pose further barriers to enhance students' green soft

skills competences, coherent and forward-looking policies within STEM educational curricula, through a combination of top-down and bottom-up approaches and public-private partnerships for skills and capacity development, are more than essential to meet successfully the green labour market's needs.

List of abbreviations:

Term	Meaning
HEA	Higher Education Area
WP	Work Package
STEM	Science, Technology, Engineering & Mathematics
HE	Higher Education
EC	European Council
SMEs	Small and Medium Enterprises
ESD	Education for Sustainable Development
EU	European Union
MOOC	Massive Open Online Course



Mini glossary¹:

- ❖ **Green economy:** is an economy that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcity.
- ❖ **Green jobs:** jobs that reduce the environmental impact of enterprises and economic sectors, ultimately to levels that are sustainable. This definition covers work in agriculture, industry, services, and administration that contributes to preserving or restoring the quality of the environment.
- ❖ **Skills for the green transition:** skills and competences, but also knowledge, abilities, values, and attitudes needed to live, work and act in resource-efficient and sustainable economies and societies. They include both technical (that are occupation-specific or cross- sectoral) and transversal skills (often referred as 'soft' or 'core' skills that are linked to sustainable thinking and acting).
- ❖ **Green skills:** skills needed in a low-carbon economy, will be required in all sectors and at all levels in the workforce as emerging economic activities create new (or renewed) occupations.
- ❖ **Soft skills:** Soft skills are character traits and interpersonal skills that characterize a person's relationships with other people. There is a rich variety of soft skills, and they all describe how we work, behave, manage a situation and interact with other people. These skills apply to all kinds of jobs and careers as they are transferable.
- ❖ **Green transition:** is a general concept of moving from a carbon-based economy to a more sustainable economy

¹The links of all sources are presented in the part of bibliography (glossary-terminology).

Chapter 1: Introduction to SOFTEN project

1.1 Few words about SOFTEN

SOFTEN is an Erasmus+ project, co-funded by EU, with a duration of 36 months (three years). The project consists of seven partners from six European countries (EL, PO, IT, PT, LT, FI) with complementary competences and high experience at EU projects and in skills development and innovative methods. The primary goal of SOFTEN project is to promote the embeddedness of soft skills in European STEM faculties and their important role in the green transition process and in 21st century professional environments.

The SOFTEN specific objectives are the following ones:

1. Improve STEM educational providers knowledge and invest in their capacity building about soft skills and green skills literacy. Through a 'Train the trainer' approach, SOFTEN project will contribute to the upgrade and advancement of STEM curricula, thus corresponding to the effort of rewarding excellence in learning, teaching and skills development. The needs of STEM academic personnel will be oriented towards tackling soft skills shortages of STEM graduates, by adjusting to the demands of the green labour market.
2. Foster STEM educational providers professional development in innovative teaching methodologies for soft skills. The promotion, application and integration of such methodologies will stimulate innovative learning and teaching practices in STEM university curricula.
3. Foster new ways of effective collaboration between universities and green industry and build sustainable partnerships towards cementing such collaborations.

Regarding its target groups, SOFTEN activities address the needs of educational providers from STEM departments in each participating country, of STEM students and of stakeholders from the green economy area. Additional stakeholders that will be reached out by the consortium during the project's lifetime involve VET (Vocational Education and Training) centres and educational policymakers in green skills area, life-long learning and green transition.

1.2 The identified needs and challenges

The transition to a climate-neutral ecosystem demands to rethink the way we operate across all sectors. Current STEM curricula in HEIs remain largely mono-disciplinary, lacking innovative resources and tools for embedding soft skills in a green context, under a more reflective approach (Karimi and Pina, 2021). Skills shortages persist and often are a result of the general inability of education to respond to the demands of the growing green industry (Maclean et al., 2018). Significant shortages in STEM students' soft skills are observed. STEM curricula usually concentrate on technical skills, overlooking soft skills, which are demanded by green sectors (Miguel, 2020). To effectively integrate soft skills in green education, STEM curricula must be updated with resources, practices and materials that will steer their transition to a multi-disciplinary skills development (CEDEFOP, 2021). The

educational community must become ready to prepare and equip young learners to obtain a variety of transversal skills to be fully harmonized to the greening of economy.

In light of all previously reported and evident challenges, SOFTEN project was designed with the mission and vision to move a step further in the area of sustainable thinking and green skills' development in STEM academic curricula. The project focuses on enriching the green literacy and education around green skills, by investigating the needs of targeted stakeholders through research activities and training opportunities, based on the principles of interdisciplinary and co-creative pedagogical approaches that promote soft skills to thrive in any STEM field. Another critical point that the project highlights is that soft skills are integral component of generic green skills and equally critical to technical skills according to the Green General Skill Index (ARTHUR, 2021). As such, new learning pathways will be leveraged for HEIs and especially for STEM academic staff, seeking eventually to improve their professional development in the area of environmental education.

1.3 SOFTEN expected results

As a response to the previous needs and challenges, SOFTEN project envisions to develop the following results (Figure 2):

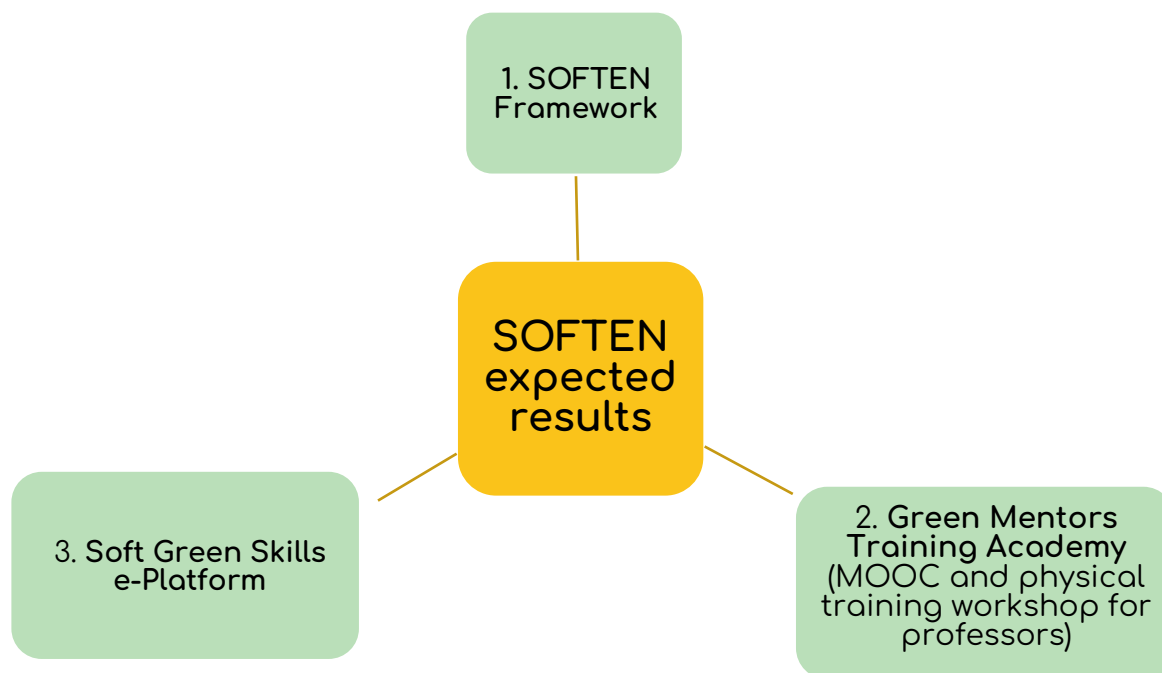


FIGURE 2. SOFTEN MAIN RESULTS

Chapter 2: WP2 activities and goal of framework

2.1 Mission and goals of WP2

Work package 2 activities of SOFTEN project initiate the implementation of research activities study is to explore, map and identify current trends, opportunities, needs and gaps about the level of soft skills' integration in contemporary STEM (Science, Technology, Engineering and Mathematics) academic study programmes in HEA in each participating country. This exploratory process is foreseen to unfold in a series of interconnected research activities with a strong multi-stakeholder component, by reaching out the three primary target groups, i.e.: STEM educational providers (professors, assistant professors, lecturers, etc., STEM students from different departments and schools and green industry stakeholders (e.g., CEOs, employees, employers, directors, etc) again through a variety of fields (e.g., circular economy, eco-entrepreneurship, clean energy, etc.).

Multiple needs and shortages have been identified regarding the previous groups in terms of the degree of existing training opportunities and practical pathways that are available for these groups, mainly to educational providers, to invest in soft skills' development in STEM educational curricula under a 'green' context. The project, since the beginning of WP2 research activities, puts special emphasis on the importance of soft skills and their relation to green competences and to the future career of STEM graduates in green economy areas. This is prioritised in the project with the aim to further understand the level of familiarisation and awareness of the above-mentioned target groups with soft skills and green transition. In addition, the necessity to explore the level of integration of soft '*green*' skills in STEM science education is already stressed by the proposal phase as multiple resources from the literature continuously support and underline the role of these skills in tackling skills mismatches in STEM fields and in addressing green labour market needs for spurring the development of a different green mindset and adaptable sustainable thinking.

2.2 Specific objectives of WP2 activities

1. Reach out to STEM educational providers and green industry stakeholders in each country to understand: (i) soft skills needs from STEM graduates for the sustainability of green industry; (ii) good educational initiatives in soft skills, to build on; (iii) educational gaps and barriers related to soft skills development at national level.
2. Develop a Framework on Soft Skills needed for the successful transition to green economy, that encapsulates the findings from WP2 research activities so as to use that knowledge for the development of educational materials in next WPs (WP3 and WP4).

Table 1 displays the main WP2 research activities, divided in separate steps:

TABLE 1. LIST OF WP2 RESEARCH ACTIVITIES

Type of activity	Goal of activity & expected outcome
Planning of the Framework	Organise the main research activities and create guidelines for each step
Step 1: Baseline analysis through preliminary desk research	Investigation of the existing level of soft skills' integration in STEM curricula and study programmes, at national and pilot university level Mapping and collection of ongoing or past good practices on soft skills integration in STEM HE curricula.
Step 2: Conduct semi-structured interviews	Assessment of existing shortages in soft skills & needs Investigation of main needs, opportunities & barriers about the integration of soft 'green' skills in STEM curricula. <u>Target groups:</u> STEM academic staff and green industry stakeholders
Step 3: Develop and distribute online surveys	Capture the perception and level of awareness of STEM educational providers and students about 'green' soft skills' integration in their STEM field and technical curricula. <u>Target groups:</u> STEM educational providers and STEM students
Step 4: National focus groups	Discuss and reflect on the main findings and results of research activities and share experiences or suggestions for embedding soft skills on STEM 'green' courses. <u>Target groups:</u> STEM university educators, pedagogists, learning innovation experts, members from VET (Vocational and Education Training) or life-long learning centers, representatives from Qualification or Career Development Centers, employers

	or employees from green economy sectors, active learning experts, researchers.
Step 5: Publications	<p>Goal: By drawing on a part of research findings from the framework the goal is to prepare and put emphasis on specific examined topics of the research analysis and focus on their further investigation by the educational STEM community.</p> <p>Recipients:</p> <ul style="list-style-type: none"> ● Researchers in green skills area ● STEM professors & staff from the STEM academic community especially educators with a green educational orientation ● Members of green businesses

For the selection of participants for interviews and surveys, a combination of invitations and snowball technique² were deployed, besides the possibility of promotion of research activities in social media channels of partners. All partners leveraged wisely and within the scheduled timeline their internal networks in order to capture gaps and needs in soft skills and perform successfully the planned research tasks. The involvement of private sector stakeholders from green companies was proven essential in the project for gaining insight in terms of soft green skills demanded by green businesses.

Since the main project's aims and results have been introduced as also WP2 activities and goal of this framework have already been described, Chapter 3 is dedicated to the theoretical part of this framework, with emphasis on the definition of soft skills and on the presentation of European Skills frameworks that include in their core structure and philosophy many characteristics and values surrounding soft skills in the framework of 21st century learning environments.

² The snowball technique foresees the identification of initial contact points of particular target groups, who then act as multipliers and recruit of the same group (Robson and McCartan, 2016).

Chapter 3: Introduction to soft skills

3.1 *The importance of soft skills*³

During the last years, the nature of work in various occupations and consequently the skills required for many young employees have changed due to various challenges and conditions, one of them being the climate change effects. This leads to new requirements for transferable competencies in the way we behave, act, think, communicate, resolve problems in all environments and especially in green professions. Universities and academic staff play a profound role in instilling new competences towards the effective adaptation of students as future employees in the green transformation of economy, with technical occupations and STEM fields being on the frontline. During the last years soft skills are becoming more and more critical and have been increasingly gaining the attention of green job employers and of academic staff.



In today's workplace the need to gain soft skills is considered critical because of globalization, virtual offices, technology and increasing society diversity in age, gender, education, ethnicity, etc. Employers tend to place more importance on the candidates' **personal qualities**, which cannot be validated by conventional diplomas or certificates, as they are often cultivated and developed in practice. This is observed not only in multinational environments and big corporations, but also in SMEs. It is strongly acknowledged that soft skills are needed for the success and competitiveness as hard skills (Dall'Amico & Verona, 2015). When it comes to the climate change effects and young employees' adaptability to manage environmental challenges, the significance of hard skills is fundamental. Besides the scientific knowledge and technical expertise in any STEM field, many studies strongly emphasize the equally vital role of soft skills in the rapidly changing labour market as a pathway to update the STEM educational curricula with new collaborative and interdisciplinary methods. Soft skills become more and more critical for technical occupations that will spearhead the sustainable transition (ILO, 2019) and for some green sectors they are considered equally fundamental as hard skills, as they can offer an adaptability in a new working environment in combination with technical know-how (Pavlova, 2018).

The need for reskilling and investment in new skills – especially soft skills – is also confirmed by the 'World Economic Forum's Future of Jobs' Report, according to which it is reported that 50% of all employees will need a 'reskilling' by 2025. This has

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³ Source of the image: storyset, available at: <https://storyset.com/illustration/soft-skills/cuate>

recently increased by the “double-disruption” of the economic impacts of the pandemic (World Economic Forum, 2020¹). In particular, in 2020 the World Economic Forum (WEF) proposed a list of the top 10 most useful skills for 2025 (listed in Table 2) which may seem quite different compared to the top skills of 2020 or 2015, which in turn are almost identical while comparing them together (Ibid.)

TABLE 2. TOP 10 SKILLS FROM 2010 TO 2025 (SOURCE: WORLD ECONOMIC FORUM, 2020)

WEF Top skills of 2015	WEF Top skills of 2020	WEF Top skills of 2025
1. Complex problem-solving	1. Complex problem-solving	1. Analytical thinking and innovation
2. Coordinating with others	2. Critical thinking	2. Active learning and learning strategies
3. People management	3. Creativity	3. Complex problem-solving
4. Critical thinking	4. People management	4. Critical thinking and analysis
5. Negotiation	5. Coordinating with others	5. Creativity , originally and initiative
6. Quality control	6. Emotional intelligence	6. Leadership and social influence
7. Service orientation	7. Judgment and decision making	7. Technology use, monitoring and control
8. Judgment and decision making	8. Service orientation	8. Technology design and programming
9. Active listening	9. Negotiation	9. Resilience, stress tolerance and flexibility
10. Creativity	10. Cognitive flexibility	10. Reasoning, problem-solving and ideation

According to the presented skills in Table 4, among the most important distinguished soft skills are **critical thinking, creativity, complex problem-solving, analytical thinking** that are placed at the top list of skills that employers believe will grow in prominence (World Economic Forum, 2020²). **Complex problem-solving** was reached at the top of skills since 2015 and was also rated at high level in 2020. For the future it seems that 2025 will be the year when technology use and development skills (technology use, technology design and programming) will grow together with the cultivation of several much-needed soft skills, leading to a transformation of jobs and of demanded competences. Under this emerging reality, soft skills seem not to lose their relevance, as many of the values and competences they include (e.g., analytical thinking, innovation, complex problem-solving, critical thinking, creativity, leadership, etc.) are highly prioritised by the world ranking rates.

3.2 How we define soft skills?

The term “soft skills” is used to describe ‘*people skills that cover personality traits, habits, friendliness, optimism, ability to deal with problems*’. They play a crucial role in a person’s life and especially profession (Korolyova et al., 2021). Unlike hard skills that are learned, are proved by academic certificates, and describe a person’s technical ability to perform a specifically defined task based on their technical

expertise and qualifications (Pratt, n.d.), soft skills are similar to emotions and someone's behavior. These are much harder to learn, at least in a traditional classroom and also often difficult to measure and evaluate. Soft skills are considered to be less specialised, less rooted in specific vocations, and more aligned with the general disposition and personality of a new employee (SoftSkills4EU, n.d.). In order to avoid misunderstanding or different interpretations, it is decided to adopt a more detailed definition of soft skills, offered by Cedefop. In this definition, soft skills are defined as the *'set of non-technical skills and knowledge that underpin successful participation in work. They are non-job specific and closely connected with personal attributes and attitudes (confidence, discipline, self-management), social (communication, team working, emotional intelligence) and management abilities (time keeping, problem solving, critical thinking)* (Dall'Amico & Verona, 2015).

Although ESCO (*European Skills, Competencies and Occupations Taxonomy*) uses 'transversal skills' as a synonym for soft skills, there is still a large variety of names, often used as synonymous of soft skills, such as: generic skills, core skills, essential Skills, skills for life, basic skills, people skills, key skills/competences. In SOFTEN project, the main term that is adopted is **soft skills**, as they are connected also to the green skills. However, in some cases we also identified the term 'transversal' skills especially during the desk research (Step 1) where some good practices were identified by all partners at national level. As such, this term is partially mentioned in this Framework based on specific resources and for specific justifications.

Classification and typologies for soft skills

Regarding the existence of a common classification around soft skills, it has been observed that there is no global consensus in the terminology to be used to indicate such skills nor a generally accepted skills taxonomy. Nevertheless, soft skills include various types and are classified in different ways. For example, according to Alex, K. (2009) soft skills are divided into three categories:

1. **Social skills** including communication and interpersonal skills as well as positive attitude, values, perception, etiquette;
2. **Negotiating skills** which relate to coping with time, stress, emotions and teamwork;
3. **Thinking skills** which imply creativity, problem-solving and decision-making.

In addition to the above classification, Gopalaswamy Ramesh et al. argue that soft skills constitute three dimensions: *attitude, communication and etiquette*. They are viewed as essential for ESD (Education for Environmental Sustainability) targets. More specifically:

- ❖ **Attitude** embraces proper mental abilities and intentions to interact with people and environment;
- ❖ **Communication** implies not only the simple act of exchanging ideas but also the act of conveying attitudes, convictions etc. in such a way that they will reach the

intended audience and make them behave in accordance with the speaker’s wishes or intentions;

❖ **Etiquette** includes norms and principles that must be followed to succeed in communication.

The element of attitude refers to the concept “*want to do*”, the communication to “*what to do*” and etiquette to “*how to do*” (Korolyova et al., 2021). Another source (Geektonight, 2023) refers to a bigger number of soft skills types. Indicatively, this source includes 8 different types for soft skills, as follows:

1. Communication Skills
2. Interpersonal Skills
3. Problem-solving skills
4. Leadership skills & Teamwork
5. Emotional Intelligence
6. Adaptability
7. Work Ethics
8. Initiative and Dynamism

In the context of SOFTEN project especially for the implementation of interviews and distribution of survey items, the consortium agreed upon the following definition of soft skills, taking into consideration elements from all identified, existing definitions through extensive online research. Therefore, soft skills are interpreted as: *‘skills that include interpersonal (social) skills and intrapersonal (individual cognitive) skills that help employees interact with other persons and perform successfully in working tasks and in their professional career’.*

Regarding the specific categories or examples that were offered to interviewees or survey participants in order to better guide them in the nature and definition of such skills, they are displayed in Table 3:

TABLE 3. EXAMPLES OF SOFT SKILLS USED FOR SOFTEN INTERVIEWS AND SURVEYS

Examples of soft skills that were used for interviews	Examples of soft skills that were used for the two surveys
<ol style="list-style-type: none"> 1. Communication skills (such as influencing, negotiation skills, active listening, presenting, leadership) 2. Self-management (such as planning, time management, goal orientation, persuasiveness, agency, taking the initiative, self-control, self-confidence, commitment, self-awareness) 3. Intellectual/cognitive skills (such as problem solving, creativity, learning from experience, analytical skills, analytical thinking, critical thinking) 4. Team management (cooperation, work in team, adaptability). 	<ul style="list-style-type: none"> Communication skills Critical thinking Problem-solving Creativity Decision-making Leadership Team management & cooperation Negotiation skills Active listening (is also part of communication skills) Empathy Analytical thinking Networking Planning & organisational skills Goal orientation Self-management

Finally, it is important to clarify that a core competitive advantage of soft skills is their transferable character as they do not refer to job-specific skills. According to Figure 3, the more general the skill is, the more transferable it is and vice versa. Soft skills are ranked at a high level of transferability due to their general and adaptable nature. This proves that the competitive market will force graduates to look beyond their technical skills gained from HEIs and adapt to new challenges that demand also adaptation, flexibility and other values beyond simple hard calculations and technical intelligence that cannot be transferred in any working environment (Dall'Amico & Verona, 2015).

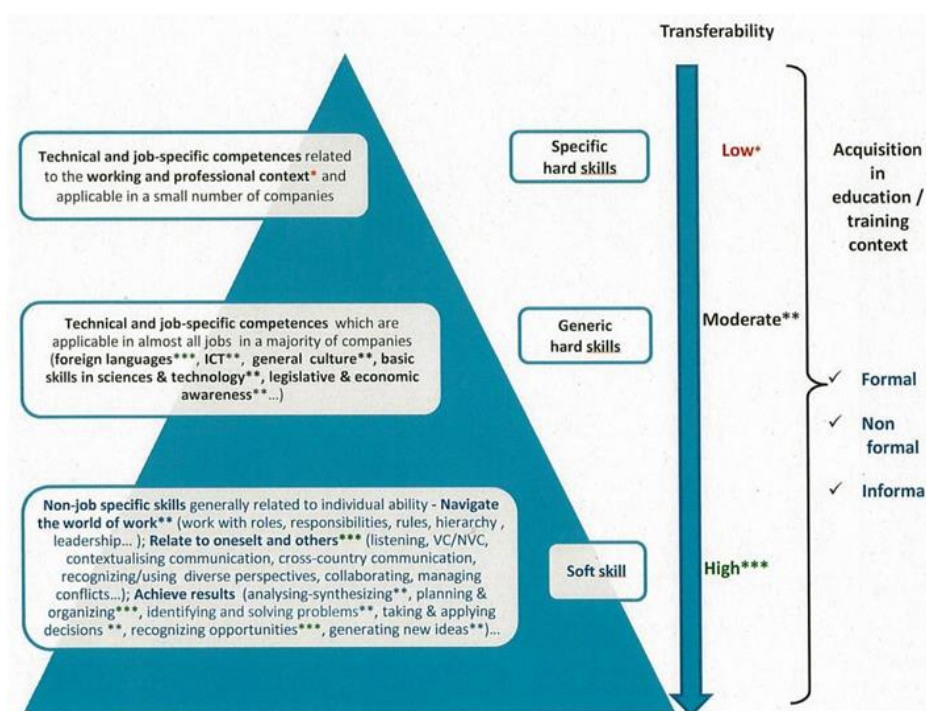


FIGURE 3. TRANSFERABILITY OF SKILLS ACROSS ECONOMIC SECTORS. INITIAL SOURCE: EU (2011)

3.3 EU frameworks on life & transversal skills

During the last years, as series of competence frameworks have been developed and published by European Commission. This sub-section will focus on two EU competence frameworks that include and promote parts of soft skills: 1) The European Framework for Key Competencies for Lifelong Learning and 2) The European Sustainability Competence Framework.

3.3.1 The European Framework for Key Competencies for Lifelong Learning

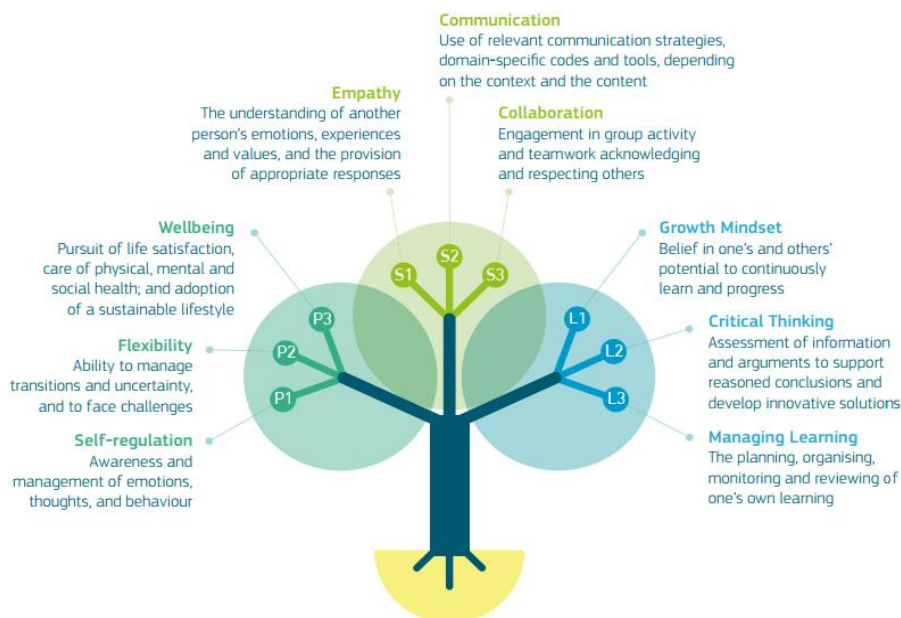
In May 2018, the EC (European Council) adopted an updated 'Recommendation on Key Competences for Lifelong Learning' to further promote the development of key competences in the European Union. In the revision of this document, the purpose of key competences is emphasised as it is stated that 'in a rapidly changing and highly interconnected world, each person will need a wide range of skills and competences and to develop them continually throughout life' (Sala et al., 2020). In

order to achieve this goal, educational systems are expected to provide high-quality education, training, and lifelong learning for all. In parallel, there is also a need to support educational staff in implementing competence-based teaching and learning approaches and explore new approaches in the assessment and validation of key competences.

The updated Recommendation defines eight key competences for lifelong learning: Literacy, Multilingual, Mathematical competence and competence in science, technology and engineering, Digital, Personal, Social, and Learning to Learn Citizenship, Entrepreneurship, and Cultural awareness and expression (Ibid.). Through this Recommendation a common European reference framework on key competences was provided, addressed to policymakers, education and training providers, social partners and learners themselves. This is the 'LifeComp framework' which aims at establishing a shared understanding, and a common language on the 'Personal, Social and Learning to Learn' competences applying to all spheres of life that can be acquired through formal informal and non-formal education and can help citizens and learners to thrive in the 21st Century. LifeComp framework can be used as a basis for the development of curricula and learning activities fostering personal, and social development, and learning to learn. The description of the competences can help in exploring its implementation and be contemplated as the embryo of a continuous discussion with teachers and educational policymakers.

LifeComp is made up of three intertwined competence areas: 'Personal', 'Social', and 'Learning to Learn'. Each area includes three competences, as Image 1 illustrates: 1. Personal Area: Self-regulation, Flexibility, Wellbeing Empathy, 2. Social Area: Communication, Collaboration and 3. Learning to learn Area: Growth mindset, Critical thinking, Managing learning.

IMAGE 1.COMPETENCE AREAS IN LIFE COMP FRAMEWORK



Several types of soft (or transversal) skills are included in all three competence areas, such as flexibility, empathy, communication, collaboration, and critical thinking, highlighting how essential is for citizens and young learners (irrespective of their expertise and academic background) to be critical thinkers and active agents through such competences that are not taught necessarily inside a classroom or a laboratory. This is critical also in terms of unleashing their dynamic potential, self-regulating their emotions, thoughts and behaviours in order to build a meaningful life and deal with complexity as responsible social and 'green' agents and reflective lifelong learners (Ibid.).

3.3.2 The European Sustainability Competence Framework

Formal education actors (teachers, headteachers, educators) at all education levels play a crucial role in raising awareness and in motivating young learners, students and graduates in developing green skills and sustainable attitudes that can promote and foster a new way of thinking, planning and action towards climate change's challenges. One of the key policy actions set out in the European Green Deal and operating as a catalyst to promote learning on environmental sustainability in the European Union is the development of a **European Sustainability Competence Framework (GreenComp)**. According to this framework, a set of sustainability competences have been identified to feed into education programmes to help learners develop knowledge, skills and attitudes that promote

ways to think, plan and act with empathy, responsibility, and care for our planet and for public health.

The *GreenComp Framework* identifies comprises four interrelated competence areas, specifically the following ones:

1. 'embodying sustainability values',
2. 'embracing complexity in sustainability',
3. 'envisioning sustainable futures' and
4. 'acting for sustainability'.



GreenComp responds to the growing need for people, citizens, students to improve and develop the knowledge, skills, and attitudes to live, work and act in a sustainable manner. Once more, soft skills play a critical role especially in the second area (Embracing complexity in sustainability) and in the third area (Envisioning sustainable futures) of GreenComp Sustainability, by contributing to the personal and professional development of both academic staff and of learners and supporting them to become systemic and critical thinkers, as well as develop agency and leveraging their adaptable capacity to resolve challenges or to develop new ideas in a more creative, flexible and collaborative way for the current and future protection of environment and the whole ecosystem. The four competence areas are interrelated and thus sustainability as a competence encompasses all four areas. In total, there are 12 sustainability competences which should be treated as parts of a whole framework (Bianchi et al. 2022). Table 4 explains in more detail each area and the definition of each competence embedded in each area:

TABLE 4. GREECNCOMP FRAMEWORK AREAS AND COMPETENCES

1 st area: Embodying Sustainability values	2 nd area: Embracing complexity in sustainability
<ol style="list-style-type: none"> 1. Valuing sustainability: Reflecting on personal and societal values and its alignment with sustainability values. 2. Supporting fairness: Justice and equity amongst past and future generations. 3. Promoting nature: Acknowledging humans as a part of nature and respecting the needs and rights of other species. 	<ol style="list-style-type: none"> 1. Systems thinking: can be understood as a tool for evaluating options, decision-making and taking action. It is necessary to understand complex sustainability problems and their evolution and how elements interact within and between systems. 2. Critical thinking: Assessing information and challenge assumptions, understanding how personal, social and cultural contexts influence thinking and conclusions. 3. Problem framing: Formulate potential challenges within several scopes of space, time, and contextual dimensions and scopes, in order to identify suitable approaches for existing problems.
3 rd area: Envisioning sustainable future	4 th area: Acting for sustainability

1. **Futures literacy**: Envisioning alternative futures that are aligned with sustainability values, social needs and within the planetary boundaries.
2. **Adaptability**: Embracing ambiguity and complexity in sustainability challenges, adapting accordingly to uncertainty.
3. **Exploratory thinking**: Fostering creativity in order to envision alternative futures by tapping into different disciplines, traditions and cultures in a transdisciplinary manner.

1. **Political agency**: Actively participating in the political sphere, mobilizing and taking action for change with the relevant stakeholders.
2. **Collective action**: Recognizing the role of communities and civil society in achieving sustainability and acting for change in collaboration with others.
3. **Individual initiative**: To identify own potential for sustainability and to actively contribute to improving prospects for the community and the planet.

The next Chapter (Chapter 4) gives exclusive emphasis on the consortium's research activities, offering useful information about current trends, gaps, opportunities, and preferences of target stakeholders upon the examined issue.

Chapter 4: Research activities and data analysis

Introduction: Overview of research activities and methodological approach

Chapter 4 is dedicated to the presentation and analysis of all collected findings from research activities that were carried out between February and July 2023. The aim of these activities was to investigate the current state of play on soft skills' development in STEM educational programmes and in green companies and capture the current level of knowledge, needs & perspectives of specific stakeholders from these environments. For planning and implementing all foreseen research activities successfully and resulting in meaningful findings for our examined topic with a good representation of all targeted stakeholders, the consortium, under the coordination of Stimuli for social change as WP2 leader, agreed upon the application of a **mixed-method approach** for the exploration of stakeholders' needs and identification of soft skills shortages. Specifically, the applied methodology included: 1) a **desk research activity** that served as preliminary findings for the study for the identification of country-specific challenges about soft skills' development within STEM HEA, 2) next a **qualitative method** such as the **preparation and implementation of 57 semi-structured interviews** in total in each country, with the engagement of green industry stakeholders and STEM educators and 3) the deployment of a **quantitative method**, specifically the **development and distribution of two online surveys**, with the engagement of STEM educators and students. The reason the partnership proceeded with a mixed methodology is to increase the engagement of targeted stakeholders and to enrich the findings with as much information and insights as possible. The collection of primary data through online interviews and surveys offered a direct opportunity to the consortium to understand in depth the needs and perspectives of targeted participants on soft skills' integration, the level of their

familiarization with soft skills and their connection with the green transition and green economy in relation to STEM graduates' future green career. Figure 4 illustrates as an overview all methodological steps that were followed for research activities that were concluded with a focus group in each country, as reflective discussion on research findings.

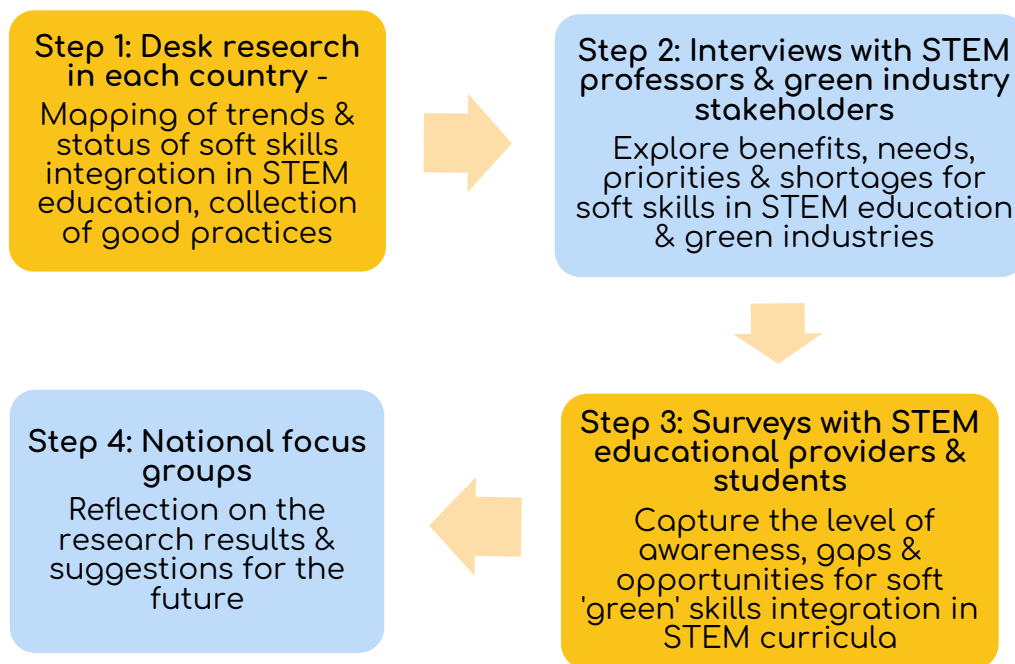


FIGURE 4. OVERVIEW OF METHODOLOGICAL STEPS OF WP2 ACTIVITIES

4.1 Step 1: Baseline analysis – desk research findings

Step 1 focuses on the first research activity that was conducted by the SOFTEN partnership. It regards a desk research activity that aimed at identifying trends and good practices around the examined issue nationwide; there was a general focus is given on general trends, existing practices and limitations or barriers on soft skills' integration that partners detected through their online desk research and mapping in different study programmes of STEM schools in their country.

The case of Finland

- *Identified trends, gaps and opportunities on soft 'green' skills integration in STEM curricula*

In Finland, it has been observed through the online research that most study programmes are run on a quite **traditional** basis regarding the content of curricula, in a similar basis with Poland and Greece. The technical curricula seem to consist of mostly individual hard skills subject-oriented study modules and courses rather than elements that are aimed at developing learner-centred or generic skills, such as soft skills.

Although the existence of good initiatives or the application of innovative methods that promote the development of soft skills, it is evident that soft skills in general are not integrated in a well-structured way in the STEM-related curricula. Indicatively, all HEIs in the city of Turku propose study programmes from many different fields (chemistry, maritime engineering, process engineering, mechanical engineering., etc.) with a focus on sustainability and energy transition, yet they provide little content related to soft skills. Most of these study programmes do not include a single course nor a clear content related to soft skills' development or training, with their focal points being field-based hard skills. At best, soft skills are significantly and formally developed through **optional project-based** courses where the green transition dimension is uncertain to appear or is poorly explored. These findings also suggest that students graduating from STEM study programme lack the soft skills required in working life. This might prevent them from being able to communicate and 'sell' a brilliant idea or innovation related to sustainability to key stakeholders, therefore hindering that innovation from reaching its full potential.

- *Good practices of soft skills integration in STEM curricula*

1st practice:

Title of practice / initiative	'Master in Natural resources management'
Responsible organisation/ educational institution and contact person	Novia University of applied sciences https://www.novia.fi/en
Short description	This Master's degree programme is for those students who wish to deepen their knowledge in sustainable management of natural resources. The studies comprise 60 ECTS (30 ECTS consist of 7 courses and a 30 ECTS thesis) and are completed in two years.
Aim / objectives	The students will obtain skills in participatory processes and conflict management in the field of natural resource management. You will also gain advanced project management and leadership skills and be able to improve your communication skills.
Target group	Students in master programme (youth, adult)
Strengths / challenges of practice	An identified strength is that the programme has a holistic view on developing soft skills and the focus is on determined, important soft skills. A concrete challenge is that the studies are mostly online.
Link / available online source	https://studieguide.novia.fi/en/13625/en/113240/HYH23H-NRM/year/2023

2nd practice:

Title of practice / initiative	'CAPSTONE studies'
Responsible organisation/ educational institution and contact person	Turku UAS https://www.tuas.fi/en/ Faculty of Engineering and Business
Short description	'CAPSTONE' uses teachers and students across study lines, mixing the students in multi-competence teams of between 5 to 8 students. Teachers act as 'coaches', focusing on both hard, and essentially soft skills competence development. Students from different fields of study work in teams on a real-life challenge/problem with a case company. It is a hands-on problem-based learning approach. They use their expertise and knowledge from their field to implement and adjust a working solution for the client/case company they are doing the project for. This study module is worth 10/15 ECTS.
Aim / objectives	'CAPSTONE' is an initiative that has been designed under the guidance of the principles of the CDIO innovative educational framework for engineering studies.
Target group	Engineering students
Strengths / challenges of practice	Regarding strengths: when students work with real challenges in multidisciplinary groups, they face many kinds of situations where soft skills (e.g. team working, leadership, communication, problem solving, self management) are needed and can be used. They get used to working with a variety of other persons. They get real challenges from external organizations. Challenges: As this module is run for all engineering students (300-600), the groups tend to be rather big and somewhat unorganized. In addition, it is challenging to get meaningful external tasks for such big amount of groups.
Link / available online source	https://www.turkuamk.fi/en/service/capstone-innovation-projects/

3rd practice:

Title of practice / initiative	Master's Programme in Urban Studies and Planning in architecture
Responsible organisation/ educational institution and contact person	Aalto university (No 1 Science university in Finland) (https://www.aalto.fi/en)
Short description	This Master programme unites expertise from the University of Helsinki and Aalto University into three major study tracks. The signature elements in the programme are interdisciplinary studies that address

	<p>urban challenge themes. These themes relate to urgent contemporary issues found not only in Finland but on the European and global scale, including controversies intrinsic to urbanisation. (Master programme, 120 ECTS)</p>
Aim / objectives	<p>The urban challenge themes may be attached to focus areas, research projects or collaborations within our universities, municipalities and regions in order to provide a constructive and critical framework for study and practice. These themes cross the boundaries of disciplines and professions and are united in addressing a common challenge and emphasizing a forward-looking perspective.</p> <p>After completing this master programme the student is able to show essential soft skills such as:</p> <ul style="list-style-type: none"> - Demonstrate a working understanding of the role of urban government - Understand and develop integrated approaches within and across urban research and applied planning - Develop responses to urban problems using relevant tools and techniques for representing, modeling, prototyping, testing and evaluating solutions - Apply and develop skills for co-production of knowledge and co-design - Work productively and cooperatively in multidisciplinary, multiprofessional and international environments
Target group	Students in master programme (youth, adult)
Strengths / challenges of practice	<p>A core strength relates to the fact that the objectives are ambitious as the mentioned skills can be considered highly valuable for graduates.</p> <p>A challenge that was identified is that to succeed in these ambitious objectives, skilled and motivated teachers are needed.</p>
Link / available online source	https://www.aalto.fi/en/study-options/masters-programme-in-urban-studies-and-planning-msc-in-architecture

The case of Greece

- *Identified trends, gaps and opportunities on soft 'green' skills integration in STEM curricula*

Greek STEM universities and departments are increasingly acknowledging the importance of soft green skills in producing well-rounded graduates who are equipped to address complex environmental challenges. There is a palpable trend towards heightened awareness of these skills as a necessary complement to technical expertise. Universities are taking strides to introduce courses and

modules that explicitly give emphases on soft green skills. These modules often cover topics such as sustainability ethics, communication strategies for engaging with diverse stakeholders, interdisciplinary problem-solving in environmental contexts and effective teamwork within sustainable development projects.

Despite the evident progress, several gaps in the integration of soft green skills still remain in Greek STEM education. A significant gap lies in the inconsistent approach to incorporate these skills across institutions and departments. Some faculties might be at the forefront of integrating soft green skills, while others could be lagging due to varying levels of recognition and commitment. Furthermore, there is a lack of comprehensive assessment methods for evaluating students' proficiency in soft green skills. While technical skills are frequently evaluated, the assessment of skills such as environmental communication, ethical decision-making, and teamwork might be underemphasized or overlooked. Research on the impact and effectiveness of soft green skills integration within Greek STEM curricula appears to be limited. This scarcity of data inhibits a comprehensive understanding of the outcomes and benefits of such integration, making it challenging to fine-tune strategies and best practices. Additionally, another significant challenge in Greece's STEM education landscape is the need for broader institutional buy-in. While there are universities and departments that are proactive in integrating soft green skills, achieving widespread adoption requires commitment from administrative levels. Additionally, the potential resistance to change, especially among faculty members who might emphasize technical knowledge, could pose challenges to the holistic integration of soft green skills. Overcoming this resistance demands concerted efforts in professional development and awareness-building.

The difficulties in embedding soft skills in STEM curricula are evident; however, promising opportunities exist for the advancement of soft skills integration within Greek STEM education. The distinction between soft skills and soft green skills is not prevalent in Greece with most people not knowing enough about the latter. Nevertheless, initiatives that actively promote the importance of these skills can drive cultural change and encourage universities to create dedicated programs or modules. Greek universities have the potential to become pioneers in soft green skills integration by fostering cross-disciplinary collaborations. By facilitating conversations between different departments and faculties, universities can leverage the collective expertise to design innovative curriculum components. These conversations are also aided by the existence of intradepartmental Master's programmes such as the Critical Thinking and Soft Skills in Biomedical and Social Sciences that is offered by the Aristotle University of Thessaloniki. In conclusion, Greek STEM universities and departments are making notable progress in integrating soft green skills into their curricula. While challenges persist, the increasing recognition of the importance of these skills and the opportunities for cross-disciplinary collaboration signal a positive trajectory. By addressing gaps, seizing opportunities and surmounting challenges, Greek STEM education can

nurture graduates who are not only technically adept but also possess the essential soft green skills needed for sustainable problem-solving and innovation.

- *Good practices of soft skills integration in STEM curricula*

1st practice:

Title of practice/ initiative	Education Technologies course
Responsible organisation/ educational institution and contact person	University of Thessaly
Short description	<p>The course focuses on the deployment of technology as an educational tool in lifelong learning contexts. It analyses traditional and emerging learning methodologies including collaborative learning, explorative learning, active learning, mobile learning, problem-based learning, project-based learning, active learning, game-based learning, etc. It focuses on how information technology can be combined with emerging pedagogies towards the enhancement of learning processes and experiences in formal, informal, and non-formal learning. The course focuses also on how technology can contribute, in combination with pedagogical models, towards the development of basic, transversal skills including analytical thinking, critical thinking, entrepreneurial thinking, problem-solving, ability to work in a team, etc.</p> <p>To complete their work, students are challenged to deploy active learning for understanding the needs of the target groups concerning specific educational objectives and themes, designing a learning solution that involves digital technology for enriching student experiences and contributing to the achievement of learning goals, and proposing methods for validating the scaffolding of knowledge. Students present their work in the classroom for the benefit of all and get evaluated by their peers.</p>
Aim/ objectives	<p>During the course, students are exposed to active learning and problem-based learning in the contexts of formal projects, in which they have to:</p> <ul style="list-style-type: none"> • Design educational scenarios for integration into a learning game that targets engineering HE and aims

	<p>to build skills for the real world. For each scenario, students are challenged to describe the educational objectives, the skills expected to be developed, and the gameplay and experience of the users that contributes to the achievement of educational goals.</p> <ul style="list-style-type: none"> • Design PBL activities for engineering education that deploy digital technology to promote exploration, experimentation, and collaboration. • Research topics related to digital services for educational purposes and research activities related to technology in education.
Target group(s)	Students
Strengths/ challenges of practice	This course introduces and relies on many innovative teaching methods, such as Active Learning and Problem-Based Learning. Unfortunately, it is an undergraduate course so it does not go into the depth that a graduate course would. Moreover, it is an elective course which undermines the importance and urgency of the subject matter.
Link/ available online source	https://www.ece.uth.gr/studies/undergraduate/courses/ece329/?lang=en

2nd practice:

Title of practice/ initiative	'Critical Thinking and Soft Skills in the Biomedical and Social Science'
Responsible organisation/ educational institution and contact person	University of Western Macedonia (GR) Aristotle University of Thessaloniki (GR)
Short description	It is about an interdisciplinary Master's Programme offered by two different departments in Greece: the School of Medicine from the Aristotle University of Thessaloniki and the Social Sciences and Humanities department of the University of Western Macedonia. The programme takes place in the facilities of the department of Medicine. Its aim is the cultivation of critical thinking, which corresponds to the ability of man to adapt to the technological,

	<p>economic and socio-cultural developments of his time, as well as to the needs arising from them. At a research level, critical thinking is associated with high mental functions oriented towards correct discourse, but also includes value, emotional and social dimensions. Thus, it presupposes the individual's ability to question concepts, assumptions, purposes, and values and based on these to justify his choices, to organize his reasoning and analyze reality; also, to be able to distance himself from personal beliefs and selfish expediencies, in order to form his opinions after examining the logical elements that determine concepts, information, relationships, phenomena, attitudes and intentional actions. Critical thinking contributes to freeing man from self-centered considerations and makes him cognitively autonomous and capable of detached evaluations.</p>
<p>Aim/ objectives</p>	<p>The main objective of this interdepartmental postgraduate programme is the provision of high-level postgraduate studies in the subjects of critical thinking and soft skills, as priority subjects for scientists of the 21st century on an international scale. This is achieved through the explicit teaching of critical thinking and soft skills in a theoretical framework which is then supplemented by the students expanding through their specialized knowledge on the subjects (biomedicine and social sciences). By utilizing their already acquired expertise from their undergraduate studies in biomedicine and social sciences, the students share knowledge and learn how to approach the real-life applications of their subjects in an interdisciplinary fashion. Another objective of this degree is to acquaint graduate students with critical thinking strategies in order to approach issues of their specialty with professionalism and successfully deal with complex problems that arise in relation to them in their future workplace.</p>
<p>Target group(s)</p>	<p>Graduate Students</p>
<p>Strengths/ challenges of practice</p>	<p>The very positive aspect of this practice is that it is tied in a formal academic setting and that it relates to a whole Master's programme (instead of the more conventional format of one course in a Master's programme being about soft skills). From our</p>

	research we could determine the use of many innovative or unconventional teaching methodologies being employed in this programme.
Link/ available online source	https://soft-skills.med.outh.gr/%cf%84%ce%bf-%cf%80%cf%81%cf%8c%ce%b3%cf%81%ce%b1%ce%bc%ce%bc%ce%b1/%ce%b1%ce%bd%cf%84%ce%b9%ce%ba%ce%b5%ce%af%ce%bc%ce%b5%ce%bd%ce%bf-%cf%84%ce%bf%cf%85-%ce%b4%cf%80%ce%bc%cf%83/

3rd practice:

Title of practice/ initiative	BEST Thessaloniki courses
Responsible organisation/ educational institution and contact person	Board of European Students of Technology (BEST) Local BEST group of Thessaloniki
Short description	Throughout the whole year BEST organises different activities where students of technology from member universities get the chance to complement their fields of study, discuss educational matters, learn and take their first steps into an international career, increase their international experience, set up contacts, improve their English level and have fun. Each BEST event is attended by 20-30 engineering and technology students like you, who have something in common: they want to live a unique experience, different from day-to-day school life!
Aim/ objectives	<p>A BEST Course is an optimised event and should fulfil these general criteria: provide new knowledge or skills for participants, being taught by professional people. Subtypes are BEST Courses on Technology, BEST Courses on Career Related Skills and BEST Courses on Applied Engineering.</p> <p>A BEST Course on Technology aims at increasing and widening the professional knowledge of the participant in a certain field of technology about modern technical applications of technology and the latest research achievements.</p> <p>BEST Course on career-related skills contains non-technological subjects that develop personal skills in topics linked with working methods, communication techniques, marketing, economics, project and</p>

	<p>organisation management and other such soft skills, stressing practical work.</p> <p>In a BEST Course on Applied Engineering, participants put theoretical knowledge into practice. They work in different teams, fostering in parallel their problem-solving skill through joint specific time-bounded tasks and limited resources and present their solutions at the end.</p>
Target group(s)	STEM Students
Strengths/ challenges of practice	<p>Some evident strengths and advantages of this initiative are proven by the following aspects: 1) Students can receive ECTS courses, 2) Because it is student run, many innovative teaching methodologies can be more easily tested.</p> <p>Regarding challenges or barriers about this practice, the most obvious ones regard 1) the lack of more formal accreditation and 2) the lack of standardized topics and materials taught, 3) limited investigation of soft skills training or integration in green topics or themes related to sustainability.</p>
Link/ available online source	http://best.web.ath.gr/en/events-en/

The case of Italy

- *Identified trends, gaps and opportunities on soft 'green' skills integration in STEM curricula*

In Italy, since 2014 there has been a strong push towards the integration of soft skills in university curricula, when European directives⁴ were acknowledged also in Italy. This integration seems, at least initially, to be motivated by a concrete need for new graduates to be able to enter the world of work more effectively and then, gradually, moving towards an awareness of the importance of transversal skills for students' professional life, personal development, and success in their studies.

A few years ago, an awareness raising project of academic teachers towards didactic issues started and led some universities to the creation of 'Learning and Teaching Centres', dedicated to didactic innovation and to the organisation of

⁴ European Standards & Guidelines for Quality Assurance. A directive is a legal act of the European Union that requires member states to achieve particular goals without dictating how the member states achieve those goals. Explore more in the following link: [https://en.wikipedia.org/wiki/Directive_\(European_Union\)](https://en.wikipedia.org/wiki/Directive_(European_Union)).

workshops and seminars for teachers, researchers and experts about didactic methodologies and tools (ANVUR Conference 2017). A debate continued fruitfully thanks to the initiative of some universities (Lotti et al., 2021). Additionally, literature clearly demonstrates that the integration of soft skills in curricula or in teaching practices inevitably goes through awareness-raising and teacher training (Bellini et al., 2020). Soft skills' integration experiences are numerous, but an existing problem is that they are **not documented**. This means that some teachers apply active methodologies during their courses with the aim of involving students and developing their listening and evaluation skills; however, these experiences are rarely described in scientific papers, because soft skills are in these cases instrumental in achieving disciplinary results, so the focus is on disciplinary learning outcomes.

An interesting proposal is put forward in "*The TASC learning framework for the education of 'non-cognitive' skills: Applications in schools of all levels*" (Imperio & Basso, 2022), following the approval by the Chamber of Deputies of a bill to introduce 'non-cognitive' skills into the curriculum of schools of all levels. TASC (full title: 'Thinking Actively in a Social Context') is a framework (Wallace et al. 2012) for learning thinking and problem-solving skills. TASC, in fact, is not only an approach but it also includes a basis of inspiring principles and theories, the range of basic skills and competences while it intends to promote, the teaching methodology, and the strategies and tools that can be used. TASC approach provides flexible reference points on which to develop core competences such as thinking (critical, creative, metacognitive), problem solving, self-regulation, communication, collaboration, learning management. It trains teachers to tolerate uncertainty with respect to the direction that activities will take, and students to move away from static dogmatism to structure the mental habit necessary to co-construct dynamic knowledge and act out skills. Another very interesting source is "Transversal competences for higher education" published in 2017, as part of an Italian Universities Rectors' Conference (Fondazione CRUI, 2017). In this study, the emerging challenges in the European HE systems were related to the support of the activation and dissemination within university courses of training activities capable of supporting the acquisition of soft skills in order to be considered strategic for enhancing the employability of students (Cleary, Flynn and Thomasson, 2006) and for developing the active citizenship skills of young adults. In Italy, the need to increase third-level training on non-disciplinary competences had been stressed with increasing emphasis both by the business world (e.g., Excelsior report) and by national and international institutes and agencies (OECD, ANVUR, etc.). Even stronger are the requests by the manufacturing world to align the quality of specialised skills possessed by students with social and transversal skills.

Non-disciplinary competences are included as a task inside the context of a specific course, this to say they cannot be separated from the processes of acquiring other knowledge or technical skills. This is the case of a course in 'Protection and Conservation of Cultural Heritage': students had been involved in a 'Role play' activity aimed at letting them apply their disciplinary knowledge and realise the

importance of transversal skills. From the perspective of applicability of the two approaches into concrete actions, it is plausible to note how the organisation of workshops parallel to teaching courses generates a 'softer' impact on the overall organisation of teaching activities.

The change and innovation that a transformation-oriented approach to teaching practices requires, on the other hand, may generate relatively little organisational turbulence in terms of structural changes in courses of study. The greatest impact will be in the cultural and intangible dimensions of teacher's work. Overall, soft skills are not interpreted as elements to be worked on separately from a content because they refer to a subject's use or learning outcomes in a specific context. The focus of this approach is to consider the use of learner-centred teaching methods in the classroom as promising, rather than designing parallel experiences. Problem solving is part of the way in which a learner attempts to find a possible solution to a problem and needs access to specific knowledge, especially to context-related knowledge.

- *Good practices on soft skills integration in STEM curricula*

1st practice:

Title of practice / initiative	Passion in action
Responsible organisation/ educational institution and contact person	Politecnico di Milano
Short description	<p>It is a catalogue of open participation extracurricular activities offered by the Politecnico to its students, to support the development of transversal, soft and social skills and to encourage/facilitate students in enriching their personal, cultural and professional experience</p> <p>Any student can participate in a "Passion in action" without any restrictions, but in some cases prerequisites must be satisfied. Recognition of the acquired skills is a mention in the "Diploma Supplement".</p> <p>Some examples:</p> <ul style="list-style-type: none"> - "<i>Creativity and innovation: is it possible to learn creativity?</i>" (seminars) - "<i>Master of Italian Design</i>" (practical activities, seminars, MOOC, face-to-face teaching) - "<i>Lean startup: the art of being entrepreneurial</i>" (practical activities, seminars, mentorship, frontal teaching) - "Futuring care. Rethink well-being by envisioning digital solutions integrated into daily life" (project laboratory, intensive school)
Aim /objectives	Passion in action initiative aims at promoting development of cross-curricular, soft and social skills

	and facilitating a personalised enrichment of students personal, cultural and professional baggage.
Target group	Politecnico di Milano students.
Strengths / challenges of practice	Involvement of professionals, invited to present their experience and perspectives No constrains in selecting courses (they are not related to students career) Participation just related to student's curiosity/interest Courses are usually unique: they are not re-propose in the next years.
Link / available online source	https://www.polimi.it/en/corsi/passion-in-action

2nd practice:

Title of practice/ initiative	Necst Lab
Responsible organisation/ educational institution and contact person	Politecnico di Milano Marco Sant'Ambrogio
Short description	<p>NECSTLab (Novel, Emerging Computing System Technologies Laboratory) is a laboratory inside DEIB department of Politecnico di Milano (Dipartimento di Elettronica, Informazione e Bioingegneria), where there are a number of different research lines on advanced topics in computing systems: from architectural characteristics, to hardware-software codesign methodologies, to security and dependability issues of complex system architectures (scaling from mobile devices to large virtualized datacenters).</p> <p>It is a real uncommon place where research meets teaching and teaching meets research, also through academics and industrials events.</p> <p>It stems from the idea that that a close connection between research and education has to be pursued to properly prepare students: research and education should not be perceived as a dichotomy. NECSTLab is an attempt to couple them in a productive and virtuous cycle where Research can obtain great benefits from Teaching.</p>
Aim / objectives	<p>To provide to the students and the researchers an environment where they can work and experiment a motivating experience:</p> <ul style="list-style-type: none"> - involving young students in research activities, creative and brainstorming phase of a research group is heavily increased, - giving students the chance to be involved in real projects, that means let them experience real design and development challenges,

	-involving students in a maieutic method, so they learn how to approach real life projects.
Target group	Politecnico di Milano students.
Strengths / challenges of practice	<ul style="list-style-type: none"> - to help students develop soft skills in the most appropriate and personalised way - opportunity to meet/interact with professionals / entrepreneurs from start-ups and companies in different fields - students are involved in typical researcher activities (attending conferences, writing a paper, discussing with other international experts, etc..). - high level or personalization of activity proposed, building of strong and trusting relation among student and the teacher require the instructor to invest a lot of time
Link/ available online source	https://necst.it/

3rd practice:

Title of practice / initiative	Engineering Empathy
Responsible organisation/ educational institution and contact person	Politecnico di Torino Mariagrazia Graziano - mariagrazia.graziano@gmail.com
Short description	<p>It is a 6 ECTS course offered in Electronic and computer engineering programmes.</p> <p>The main points covered will be:</p> <ul style="list-style-type: none"> - Non-violent communication (NVC techniques), conflict resolution - Understanding and applying empathy and emotional intelligence in teamwork and relations with others - Followership, leadership - Individual and group self-observation during the relational, creative and communicative process - Awareness of one's own body, emotional and mental state and impact on relationships and communication - Transactional analysis in relationships and communication: empathy, roles, the relational script, the relational game - Effective communication in public: voice, body, posture, importance of speech, tone, timbre, pauses; awareness of action and reaction mechanisms in the communication dynamic of action and reaction in the communication dynamic

	- Development of creative capacity and problem solving, confidence in intuition
Aim / objectives	<ol style="list-style-type: none"> 1. to make the engineer aware of the interpersonal dynamics that make one's own technical contribution less effective, 2. to become aware of the skills/difficulties in relating to individuals and the group at the various levels and to identify the stimuli and levers useful for defusing such difficulties and/or enhancing such skills 3. to trigger effective behaviour during the performance of normal project activities carried out in a team by overcoming one's own limits and experimenting with methods of understanding and communication, 4. to promote relational, collaborative and communication skills aimed at group success as a driving force for personal success
Target group	Politecnico di Torino students but also to people outside university (graduated engineers or students from other universities)
Strengths / challenges of practice	<ul style="list-style-type: none"> - laboratories with practical experiences and multidisciplinary projects, - use of metacognition approach in observing relations among peers in teams
Link / available online source	https://didattica.polito.it/pls/portal30/gap.pkg_guide.viewGap?p_cod_ins=01TZFOV&p_a_acc=2022&p_header=S&p_lang=&multi=N

4th practice:

Title of practice / initiative	POK Bridging Students' Soft Skills Gaps with MOOCs
Responsible organisation/ educational institution and contact person	Politecnico di Milano Alessandra Tomasini/Federica Brambilla
Short description	<p>POK, Polimi Open Knowledge (www.pok.polimi.it) is the MOOCs (Massive Open Online Course) platform designed by METID (the service of Politecnico di Milano, devoted to e-learning and e-collaboration on the basis of Open edX.</p> <p>Courses available are now more than 100 with a specific series of 7 MOOCs, both in English and Italian, devoted to soft skills. They related to:</p> <ul style="list-style-type: none"> - managing changes, - managing conflicts, - working in multidisciplinary teams,

	<ul style="list-style-type: none"> - embrace diversity, - creative and design thinking
Aim / objectives	The portal has been conceived for accompanying students in overtaking all the obstacles they can meet in the main passages of their career, for example from university to job. The Soft skill series is specifically aimed at strengthening and enhancing, certain soft skills to smooth the step that takes them into the job scene.
Target group	Everyone interested
Strengths / challenges of practice	<ul style="list-style-type: none"> - courses are accessible every time, everywhere - learners can attend them at their own pace
Link / available online source	<p>Platform - www.pok.polimi.it</p> <p>https://www.pok.polimi.it/mod/data/view.php?d=1&perpage=10&search=&sort=0&order=DESC&advanced=0&filter=1&advanced=1&f_1=&f_4=&f_6=&f_8=Soft+Skills</p>

5th practice:

Title of practice / initiative	Contamination Lab
Responsible organisation / educational institution and contact person	Università degli Studi di Cagliari Anna Rita Etzi, Responsabile coordinamento progetto - aetzi@amm.unica.it Maria Chiara Di Guardo, Direttore scientifico e responsabile della formazione - diguardo@unica.it
Short description	<p>Contamination Labs are places of contamination between university students (and others) from different disciplines that expose participants to stimulating and multidisciplinary environments, also designed to encourage entrepreneurial approaches.</p> <p>They promote the culture of entrepreneurship, sustainability, innovation and doing, as well as interdisciplinarity and new learning models, which reduce the gap between academia and innovation.</p> <p>They are part of the Italian CLab Network, that is a 'CLab incubator' promoted by the Università degli Studi di Cagliari and supported by the Ministero dell'Istruzione e del Merito. It gathers within it and connects existing and future Contamination Labs that operate and identify with the overall challenge of making a contribution to the creation of an entrepreneurial ecosystem, of creating reflection and new know-how on the dissemination of enterprise culture and business creation in university contexts.</p>
Aim / objectives	CLabs foster the acquisition of new skills aimed at developing innovation projects with a social and

	entrepreneurial vocation, in connection with the strengths of universities and territories.
Target group	Students
Strengths / challenges of practice	<ul style="list-style-type: none"> - to promote transdisciplinarity - to support collaboration and fertilization among universities and companies and the labour market
Link / available online source	https://clabunica.it/en/

6th practice:

Title of practice / initiative	Role Playing to learn Transversal Skills
Responsible organisation/ educational institution and contact person	Politecnico di Milano Course: ARCHITECTURAL PRESERVATION Prof. Nora Lombardini
Short description	The subject of "Edugame Role Play" is the process in which the protection of historical objects takes place. This process is characterised by a conflict because the stakeholders (owners of historic buildings, users of historic sites, heritage conservators, local community, tourists, authorities of various levels) can have different and even conflicting goals and have to reach a compromise.
Aim / objectives	"Edugame Role-Play" lets players (students) familiarise with different stakeholders' roles (powers, competences, needs), to apply specialistic knowledge acquired through the university curriculum, but also to "bring into play" negotiation, team-working, conflict management and communication skills.
Target group	Architectural Design and History Students at Politecnico di Milano "Edugame Role-Play" is especially designed to be used in Heritage Protection courses, involving students who have completed the Bachelor of Science's Degree in Architecture or Engineering
Strengths / challenges of practice	<p>Role Play has been selected as methods and designed so that it:</p> <ul style="list-style-type: none"> engages students, enhancing learner interest and motivation in the content. puts them in a situation in which they have to make decisions both applying knowledge, and considering values, perceptions, decision options, and responding to feedback, improving cognitive learning. lets apply theoretical concepts to real life situations. lets improve analytical and decision-making skills. lets change views or attitudes toward issues or people, and empathy toward others. lets achieve longer-term learning advantages.

Link / available online source	https://www.metid.polimi.it/en/portfolio/progetto-edugame/
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The case of Lithuania

- *Identified trends, gaps and opportunities on soft 'green' skills integration in STEM curricula*

The current educational landscape in Lithuania does not differ excessively from the status that was presented for the previous countries around the examined topic. The need for a modernization in the agenda and topics of STEM curricula in the area of skills' development, the promotion of importance of humanistic education – as already stressed by the World Economic Forum (Phelps, 2014) – as well as the poor attention or the limited prioritization for soft skill's learning and training in STEM classes are the main points of the conduct research and facts that are systematically indicated by different sources of literature.

In Lithuania, the national education policy and its development is organized and managed by existing laws and regulations as well as universities' and applied science universities' statutes. The overarching aim of the Education Law is to educate persons, who are share values to be decent, curious, responsible, patriotic, and able to communicate their knowledge and contribute to cultural development; additionally, the ability to use mother tongue and foreign languages, as well as have proper computer literacy, modern social competencies and ability to create their own life and live healthily are also prioritised as competences or way of thinking and attitudes that are cultivated by the education system. When it comes to the ambition to discover and nourish creative competencies in the Lithuanian populous, this takes the second aim in the Education Law. However, it is recognized that creative competencies together with business and technology literacy could be very beneficial for person and the population in general as well as the advancement of the national economy, its competitiveness and its sustainable development in the context of people's and students' continuous cognitive development, and life-long learning process.

Though it may seem that the current situation with STEM in Lithuania is not at the greatest level, efforts are being made to find solutions to the identified problems related to lack of transversal /soft skills and lack of fostering interdisciplinarity, as follows: *"To address these problems, Lithuania plans to develop a network of methodological and regional interdisciplinary STEAM /.../ centers for students. /.../ Methodological STEAM Centres will aim to develop students as future STEAM researchers, innovators, developers and producers of new high value-added products and services, by strengthening the subject and interdisciplinary, creativity, initiative, entrepreneurial and leadership competences they need for a successful professional career"* (EASTEM project).

Based on the previous mentioned example, the STEM centers that are being set up in Lithuania for pupils include laboratories for programming (robotics), engineering, life sciences, physics and chemistry (Poviliūnas, 2019) which are very important not only for soft skills development, but moreover for hard skill development, which are no less important than the other ones. However, in order to strengthen STEM centers and education in general with soft skills, changes are inevitable. Soft skill development in the Lithuania HE system could be seen as one of the possible ways of how existing problems to connect hard with soft skills could be tackled and the below presented good initiatives are very much necessary for such change.

At this point is important to acknowledge existing examples. One of them could be the training platform for soft skills implementation in the school curriculum could be listed as an "Initiative for improving teachers' socio-emotional competencies". This initiative was started by Šiauliai city municipality. Here, school-teachers could improve their knowledge and gain extra expertise in socio-emotional competencies for their daily interactions with pupils. The rise of such initiative is a strong sign of the existing need for soft skills improvement. However, the need for soft skills is hard to identify amongst university students. Several independent projects seek to evaluate the universities' curricula in Lithuania. Additionally, faculties and universities are continuously reviewed by outside evaluators.

Furthermore, several independent projects regarding the evaluation of HE in Lithuania are presented. The first one is the UE4SD project. The UE4SD project summarized that the key principles to bring sustainability in university curricula are (1) future thinking; (2) critical and creative thinking; (3) participation and participatory learning; (4) partnerships; (5) systemic thinking (Kapitulčinová et al., 2015). Another example worth mentioning here is SCIENT project. Its results uncovered *"the lack of the following subjects in an entrepreneurship programme directed to STEM students: entrepreneurial culture, communication and negotiation techniques, finances, basic management tools, logistics for manufacture/delivery of product, setting prices, selling products, internationalisation, business models, marketing and market research, and soft skills in general"* (Ferreira et al., 2021). Finally, a third example is coming from the business sector. As it was observed projects under "logeb LT" *"are poorly interconnected, fragmented, and business innovation facilitation services account for only a small fraction of all support services. Therefore, the success of the measures will depend on further development of the innovation policy system (particularly the "soft" innovation support ecosystem) together with the ongoing Innovation Reform, R&I regulation, interpretation, etc."* (Martinaitis et al., 2020).

• *Good practices on soft skills integration in STEM curricula*

1st practice:

Title of practice/ initiative	EDU_Lab
Responsible organization/ educational institution and contact person	Kaunas University of Technology
Short description	EDU Lab is ready to fill the gaps in Lithuanian lecturers' competences by leveraging the expertise of our university and international partners in the field of higher education. One of the EDU Lab initiatives is called "Lecturers' Café". It is a tradition at KTU, which once a month brings together KTU lecturers to discuss issues of importance to the academic community. This creates an informal and safe environment for teachers to discuss various issues, establish new contacts and find like-minded people. Another very important to mention activity is training for STEM courses lecturers. They seek to improve STEM educators' competencies. To learn about other training and courses, please visit the EDU Lab web page.
Aim/ objectives	EDU Lab define its goals: <ul style="list-style-type: none"> • We are developing and improving the system of modern didactic competence development at KTU; • Encourage lecturers to choose and apply appropriate and innovative didactic tools to ensure the quality of studies; • We believe in a "different" teaching and learning philosophy that is in line with contemporary educational trends.
Target group	Teaching staff in the university
Strengths/ challenges of practice	EDU Lab offers courses for lecturers, and encourages educators to share their knowledge and experiences.
Link/ available online source	https://ktu.edu/edu_lab/

2nd practice:

Title of practice/ initiative	"Follow up" programme
Responsible organization/ educational institution and contact person	Kaunas University of Technology
Short description	On the basis of this programme, EDU Lab experts, together with the lecturers, will integrate the chosen didactic approach into the study module.

	For example: lecturers who have completed the Design Thinking training will be invited to join a working group on the implementation of this method in the study module. Together with EDU lab experts, the module structure will be reviewed, the lecture/exercise/lab plan will be developed, the student assignments will be prepared, and the assessment system will be discussed and implemented.
Aim/ objectives	<p>Programme goals are:</p> <ul style="list-style-type: none"> • Sharing knowledge • Networking within the university • Developing practical applications for conducting lectures and training
Target group	Educators in KTU
Strengths/ challenges of practice	"Follow up" programme allows educators to share their practices and knowledge.
Link/ available online source	https://edulab-en.ktu.edu/follow-up-programmes/

3rd practice:

Title of practice/ initiative	ECIU university
Responsible organization/ educational institution and contact person	European Universities alliance
Short description	<p>The ECIU University is one of the 41 European University alliances that are part of the European Universities initiative. This initiative brings together universities to address societal challenges and skills shortages faced in by European countries. The university alliances test different models of the concept of European Universities and examine its potential to transform higher education. The European Universities Initiative is piloted in 2019-2022 and will be fully rolled out and scaled up under the next Erasmus programme 2021-2027.</p> <p>The ECIU University is an EU-funded European University that will create a completely new educational model on a European scale. The ECIU University gathers together learners, teachers, and researchers to cooperate with cities and businesses and solve real-life challenges.</p> <p>Specific objectives per target group:</p> <p><u>For learners:</u></p> <ul style="list-style-type: none"> • Work in multi-disciplinary and international teams that allow you to gain professional skills and knowledge. • Experience a new, innovative way of learning, and by doing so, help to co-create the ECIU University. <p><u>For university staff:</u></p> <ul style="list-style-type: none"> • Problem solve today's most relevant societal and economic challenges.

	<ul style="list-style-type: none"> Pioneer cutting edge educational concepts: challenge-based learning and micro-credentials. <p><u>For researchers</u></p> <ul style="list-style-type: none"> Explore the ECIU University joint long-term research strategy and our shared research areas. Discover ECIU Researchers Mobility Fund opportunities. <p><u>For business and society</u></p> <ul style="list-style-type: none"> Work together and connect to current learners and prospective employees. Join the strategic ECIU University partners by co-creating education innovations in Europe.
Aim/ objectives	ECIU university mission ECIU University is an agile, open agora at the European level for solving multi-disciplinary societal challenges, doing research and learning for life. We create an invigorating model of a true European University for the benefit of European society.
Target group	University staff, researchers, students, businesses and general society
Strengths/ challenges of practice	The key strengths of ECIU university are listed as (1) an open community, (2) an innovative co-creation model, (3) European education and research, and (4) cutting-edge technologies
Link/ available online source	https://www.eciu.eu/

4th practice:

Title of practice/ initiative	Shipping and Logistics Information Systems (SLIS) study program
Responsible organization/ educational institution and contact person	Lithuanian Maritime Academy (LMA)
Short description	Future professionals will require special technical, digital, and soft skills to be capable of effectively function in a rapidly changing climate. Changes in the labour market influence changes in study programs, and here no exception is the Lithuanian Maritime Academy. The Academy has responded to the market challenges with a new study program meeting the labour market needs. A new study program called <i>Shipping and Logistics Information Systems (SLIS)</i> was prepared for the digital technical, specific, and more importantly soft skills development of specialists that are part of the maritime transport sector with the perspective to partial adjustments in other study programs by reworking them to the digitalization in the global supply chain.
Aim/ objectives	The <i>SLIS</i> study program is aimed at the development of a combination of skills and competencies from different

	professional foreland and hinterland logistics fields to be able to deal with global supply chain connectivity problems.
Target group	Students of <i>Shipping and Logistics Information Systems (SLIS)</i> study program at the Lithuanian Maritime Academy
Strengths/ challenges of practice	<p>SLIS study programme is made in such a way that it will help to develop soft skills in different ways, as follows:</p> <p>1.Soft skills-oriented education through the study process implementation. Soft skills are developed by implementing three main components of the study process, starting from the so-called input, as a provision of the key knowledge; following by the processing, meaning education and training processes themselves, and being finalized by the output characterized by learning outcomes and trained skills.</p> <p>2.Development of “soft skills” through each content unit. All the courses of the study programme are distributed into four blocks (i.e., general courses, informatics, statistics, and logistics) and within the three years of studies, the focus deviates from lower order cognitive skills, such as remembering and understanding, to higher-order cognitive skills, such as evaluating and promotion of a creative thinking. There is an extensive period of studies devoted to the practical training in real time and real system simulators. Such an arrangement of the study programme is oriented toward the training of practical skills in specific sectors, while the applied methods are balanced toward the development of “soft skills” through each content unit.</p> <p>3.Soft skills training through interpersonal and systematic competencies. Part of soft skills engrained is the category of interpersonal competencies. That type of soft skills is mastered through teamwork-related tasks, along with the sharing of responsibilities between the team members, improving in parallel leadership competencies and participating in different roles in simulators. One more part of soft skills, i.e., systemic competencies, is practised in the final stage of the studies, where students must do experiments with real data and find optimal solutions as well as to formulate software projects or decision projects for the optimization and problem solution in selected research fields by means of data analysis methods and technological innovations.</p>
Link/ available online source	https://etalpykla.lituanistikodb.lt/object/LT-LDB-0001:J.04~2021~1654175375328/J.04~2021~1654175375328.pdf

5th practice:

Title of practice/ initiative	English for Specific Purposes and the Second Foreign Language (ESPSFL) study program
Responsible organization/ educational institution and contact person	Mykolas Romeris University (MRU)
Short description	<p>Study program of English for Specific Purposes and the Second Foreign Language (ESPSFL) was created by the teaching staff of the Institute of Humanities, Mykolas Romeris University in Vilnius, Lithuania, to accommodate the expectations and conditions of the current/future labour market. The demand for the program arose from the requests of prospective applicants and employers. The ESPSFL program is made in such way that its subjects fall under two main categories: basic philology studies (English and second foreign language) and applied studies (studies of English and second foreign language for specific purposes and translation). The graduates of ESPSFL acquire soft skills and competencies obtained during the studies, which later on, when they become employed, they apply them at work.</p>
Aim/ objectives	<p>The aim of the program is two-fold, as it seeks to provide the students with the general philological education (general educational approach) and to develop their skills to communicate in two foreign languages used for specific purposes (applied interdisciplinary nature-oriented approach).</p>
Target group	<p>Students of <i>English for Specific Purposes and the Second Foreign Language (ESPSFL)</i> study program at Mykolas Romeris University</p>
Strengths/ challenges of practice	<p>ESPSFL study program focuses on development of the following competencies, which are also could be considered its main strengths:</p> <ol style="list-style-type: none"> 1. Multilingual Competence. In addition to English, graduates of the ESPSFL study program achieve proficiency in another or even two more foreign languages, which established their competitiveness in the labour market. As a second foreign language students can adopt either languages of global communication (French, German) or languages of economically prosperous countries that are becoming increasingly important in the international arena (Korean, Norwegian). 2. ESP and professional communication competence. In Lithuania, the ESPSFL study program is now a unique interdisciplinary undergraduate study

	<p>program of applied nature in the field of philology. The ESPSFL learners' main professional in-field knowledge and communication competences are also developed corresponding the indicated requests of the potential and current employers.</p> <p>The practical implementation of the programme focuses on developing students' understanding of forms and principles in spoken and written communication for specific purposes; developing students' skills in professional field information analysis and usage of proper subject-specific terminology; preparing students for international oral and written communication.</p> <p>The case study of the Mykolas Romeris University presented the application of the soft skills and competences. It could be stated that the program successfully focuses on fostering multilingual, English for Specific Purposes, and professional communication, as well as intercultural communication competencies. The feedback that was received from the graduates testifies that they acquire such competences as indispensable multilingual, intercultural and professional communicative competencies, which later they apply work.</p>
Link/ available online source	http://espeap.junis.ni.ac.rs/index.php/espeap/article/view/882

The case of Poland

- *Identified trends, gaps and opportunities on soft 'green' skills integration in STEM curricula*

In Poland, as it was indicated by online research, the integration of soft skills as new type of competences needed for 21st century learning environments is poorly visible because soft skills are not so widespread in STEM educational programmes of HEIs. Generally, in STEM education are most used activities aimed mainly at children or younger youth and are often applied at the level of primary and early school education. At that level, there are several good and promising initiatives that foster soft skills in practice (such as the project 'Kitchen Lab for Kids'⁵ or the online course 'STEAM education in kindergarten'⁶). Regarding the state of play at university level, the only interested initiatives that focus in one or another way on the promotion of STEM students' soft skills are scattered and are often initiated in the framework of active working methods, such as partial experiments or application of design

⁵ More info about the project 'Kitchen lab for kids': <http://kitchenlab4kids.eu/>

⁶ More info about the course 'STEAM education in kindergarten': https://navoica.pl/courses/course-v1:Akademia_Ignatianum_w_Krakowie+AIK_WP_05+2022_E06/about

thinking methodology combined with creative thinking and critical approaches targeted to university students. Despite the existence of few valuable and important activities at university level, such initiatives are applied separately by a minority of universities.

With regards to the teaching status in higher education in Poland, it is observed that there are not massively open educational practices and methods that promote systematically the application of interdisciplinarity and consequently training or teaching on soft skills. **The education system is based more on old-fashioned teaching methods** developed years ago, with very formalized relations between the academic teacher and the student. In spite of this reality, other factors such as social and technological evolution as well as access to information and exchange of knowledge in some way force the necessity of changes in the teaching system at university level. Nevertheless, the problem remains as HE STEM study programmes very slowly experiment with new modes in the way of teaching and of the teacher-student relationship, especially in the context of soft skills in order to go beyond a certain "comfort zone" and "out of the box" thinking in technical curricula. This tradition is the result of the following challenges that were identified in many STEM curricula:

- 1) **Lack of appropriate knowledge and awareness among the academic staff** of i) what soft skills really mean and how they can improve STEM teaching in relation to a more holistic development of green thinking and 2) of what are the benefits of soft skills' use in the case of academic education.
- 2) **Limited practical experience from academics and teachers** in HE in solving tasks in conditions of real market competition.
- 3) **Limited time for the implementation of individual university courses** and at the same time a high level of specialization and a large amount of detailed information with the current high state of development of scientific fields. This means that only knowledge from a narrow range of a given field of science is presented on individual courses.
- 4) **Lack of willingness or insufficient motivation** of a part of the academic staff to introduce changes and improve their didactic skills. This generally blocks the development of didactic skills, and even more so when it concerns the use of an interdisciplinary approach to the implementation of specific didactic courses.

- ***Good practices of soft skills integration in STEM curricula***

A review of the literature and online sources indicate that there are not many activities focused on soft skills at Polish universities in the STEM area. However, the following identified practices indicate the effort that has been initiated to this direction, by supporting and motivating students to further develop their soft skills before entering the labour market.

1st practice:

Title of practice / initiative	'Soft skills in the centre of attention'
Responsible organisation/ educational institution and contact person	Łazarski University (LU) an academic and educational private institution in Warsaw
Short description	<p>The idea of including soft skills in the curriculum appeared at Łazarski University in the academic year 2012/2013 as a result of a series of modern techniques and methods of teaching trainings. The trainings brought together a group of dozen educators with different lengths of service, who shared their experiences and opinions concerning the quality of students' work during the training. Most opinions focused on the fact that students are not properly prepared to study in the sense of improving their knowledge under the guidance of a professional. The project was initiated for improving the level of soft skills among students and for better adjusting the skills of graduate students to the labour market. The project originally included one semester of classes during which the students prepared for Oxford debate.</p>
Aim / objectives	<p>The main objective was to instill a differentiated approach to students in order to give the poorest students the opportunity to fill their individual skill gaps and to give students the opportunity of further development under the guidance of individual tutors. Another aim was to help understanding the point of engaging and create the motivation in acquiring new skills.</p>
Target group	Students of Łazarski University
Strengths / challenges of practice	<p>The existing and obvious strengths that this programme are related to the effort towards:</p> <ul style="list-style-type: none"> ● effective communication ● openness to learning and continuous development, ● active engagement ● teamwork skills as well as project-related skills <p>The students learnt about and practised soft skills, preparing in parallel during the whole semester under the guidance of professors an Oxford-style debate on a chosen topic. Another positive aspect of the subject is the improvement of the level of soft skills among students.</p> <p>The first stage of the project was to define its main challenges by educators involved in the project. Some identified challenges are mentioned below:</p> <ul style="list-style-type: none"> ● use of sources, ● formation of arguments ● debating and making short statements based on scientific facts ● self-organization of work

	<p>Another issue that the team of lecturers often face are mostly relevant to didactic work with project groups and with the necessity to solve crises in groups.</p> <p>Overall, the evaluation results of the first year of the project's application did not reveal total satisfaction from the students, as it was proven that the tasks turned out to be too difficult for many students, remaining beyond their capabilities (especially in terms of self-organization and teamwork). However, in the following years the course itself was completely modified. A differentiated approach to students was adapted in order to give to the poorest students the opportunity to fill their individual skill gaps and offer to best students the chance of further development under the guidance of individual tutors. In the evaluation survey conducted in 2016/2017 academic year, over 96% of students declared improvement from the level at which they started the subject and 90% found the classes useful on the labour market having enhanced as well their professional development.</p>
Link / available online source	<p>https://www.e-mentor.edu.pl/artykul/index/numer/70/id/1309</p>

The case of Portugal

- *Identified trends, gaps and opportunities on soft 'green' skills integration in STEM curricula*

The integration of soft skills into science, technology, engineering, and mathematics (STEM) study programs in Portugal has become a subject of growing importance and recognition. Soft skills, encompassing non-technical abilities like communication, teamwork, leadership, and problem-solving, play a critical role in preparing well-rounded graduates for the modern workforce.

There is a noticeable trend towards greater awareness and familiarity with the concept of soft skills among educators in Portugal's STEM courses. This growing recognition signifies an understanding of the significance of soft skills in shaping successful STEM professionals who can effectively navigate real-world challenges. Another positive trend is the integration of soft skills into STEM curricula at various universities. Some institutions have introduced dedicated programs or courses aimed at teaching and engaging students in the development of essential soft skills. Topics such as organizational communication and teamwork are commonly emphasized in these initiatives.

Despite the progress made in soft skills integration, several gaps remain in Portugal's STEM courses. One notable gap is the lack of standardized training for professors regarding soft skills. Insufficient training may hinder educators from fully grasping the importance of these skills and effectively incorporating them into their teaching methodologies. Additionally, there may be disparities in the

approach to soft skills integration among professors. While some educators actively include soft skills in their courses, others may focus predominantly on hard skills. This inconsistency underscores the need for a **more cohesive and holistic approach to integrating soft skills** across all STEM disciplines.

During the course of completing desk research for this overview on the incorporation of soft skills in Portugal's STEM curricula, it was discovered that there are no specialised studies or extensive study on this issue. This lack of dedicated research limits our understanding of the current state of soft skills integration and its impact on students' academic and professional development. It also hinders efforts to identify effective strategies for incorporating soft skills into STEM education and may pose challenges for policymakers in developing targeted policies. Additionally, the dearth of research may mean missed opportunities to optimize and innovate in education, leaving potential benefits of soft skills development unrealized. There are promising opportunities for further enhancing soft skills integration in Portugal's STEM courses. Projects and initiatives that promote the importance of soft skills can serve as catalysts for change and encourage universities to adopt more comprehensive soft skills development programs.

One of the significant challenges in soft skills integration is the lack of interest and initiative within the university ecosystem, particularly at the management level. The absence of a concerted effort to introduce soft skills as an integral part of STEM courses may hinder their full potential in preparing students for the dynamic demands of the job market.

- *Good practices of soft skills integration in STEM curricula*

1st practice:

Title of practice / initiative	UTAD Soft Skills Plan
Responsible organisation/ educational institution and contact person	UTAD - Universidade de Trás-os-Montes e Alto Douro
Short description	The great competitiveness of the labour market makes employers, when hiring new employees, look more and more at the interpersonal skills (soft skills) of the candidates, which are increasingly valued by employers, as a complement to the technical knowledge and skills (hard-skills). Implementation of training programmes for their students, providing them with knowledge that will help them compete in the demanding labour market, so the formalised existence of training initiatives in the area of soft-skills is of great importance.
Aim / objectives	The UTAD Soft Skills Plan (PSSUTAD) is mainly aimed at giving students contact and experience with interpersonal skills, and to this end UTAD has drawn up

	an annual plan of activities. This plan is made up of a set of lectures that the students enrolled must attend, plus the execution of a group project in which the students will be able to practice the contents and knowledge acquired during the training course. Students who meet the criteria of this Plan will be awarded the respective certificate of completion.
Target group	Students If any openings are left available, other members of the academic body or overall public may participate.
Strengths / challenges of practice	One big strength of the UTAD Soft Skills Plan is that it is actually credited, and students will receive ECTS for participating.
Link / available online source	https://www.utad.pt/gform/wp-content/uploads/sites/25/2021/10/Regulamento_Softskills-8aEdicao-v4.pdf

2nd practice:

Title of practice / initiative	UTAD - Skills for Life
Responsible organisation/ educational institution and contact person	UTAD - Universidade de Trás-os-Montes e Alto Douro
Short description	<p>The need for skill updating and retraining for the active population, particularly those with advanced degrees in STEAM. The programme was intended to meet the difficulty of continuous learning and the increasing complexity faced by professionals, government, and businesses by fostering skill updating and retraining throughout life.</p> <p>A joint commitment to promote the updating and retraining of skills of the active population, particularly at higher education level in the field of STEAM, reinforcing the need for continuous learning throughout life, and thus contributing to meeting the growing complexity of the challenges faced by professionals, public administration and different enterprises.</p>
Aim / objectives	<p>The programme has the following objectives:</p> <ol style="list-style-type: none"> 1. build a better, more developed, free and fair world, through the value of the knowledge it produces and puts at the service of society, in perfect harmony with nature. 2. provide all students with the best overall learning experience, training competent professionals, human beings with social awareness, integrated and autonomous, thanks to the quality of its

	<p>teaching and in the light of the principles of active citizenship, respect for life and nature.</p> <p>3. produce and disseminate innovative scientific knowledge, in line with the needs of society and companies, as an accelerator of economic development and the improvement of people's quality of life, being an important factor of territorial cohesion.</p> <p>4. develop training actions in the area of soft-skills and in areas identified as fundamental to the development of students' autonomy and employability. UTAD already develops an annual Soft-Skills programme for students, but this offer needs to be extended and scaled up.</p>
Target group	Students
Strengths / challenges of practice	<ul style="list-style-type: none"> • Major funding • Interconnection with other university initiatives on training
Link / available online source	https://wwwcdn.dges.gov.pt/sites/default/files/2_ut_ad_final_signed.pdf

3rd practice:

Title of practice / initiative	FCT Curricular Profile
Responsible organisation/ educational institution and contact person	NOVA School of Science and Technology (NOVA FCT)
Short description	<p>The lack of soft skill integration into high education curriculum led to this program creation, to address this issue by reinforcing training with these fundamental skills and by introducing complementary competences.</p> <p>The Curricular Profile is a reinforcement of the training with skills that we consider fundamental for the employability of students, from the preparation of the Curriculum Vitae, to the understanding of science and technology as we understand it today, within a logic of sustainability and digital transformation.</p>
Aim / objectives	In order to enrich the students' training with complementary competences, namely soft skills, contact with companies (internships) or research and entrepreneurship, FCT NOVA has introduced these competences in the curricular structures of all Bachelor, Master and Integrated Master courses.
Target group	NOVA Students
Strengths / challenges of practice	<ul style="list-style-type: none"> • The FTC Curricular Profile is actually part of the curricula • ECTS credited

Link / available online source	https://www.fct.unl.pt/node/18046
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4th practice:

Title of practice / initiative	Upgrade
Responsible organisation/ educational institution and contact person	Universidade do Porto
Short description	<p>The lack of personal and social skills, as well as job-related competences and tools, needed for successful integration into the labor market. The program was created to address these issues by offering modules aimed at developing these skills and improving employability.</p> <p>UPgrade is a programme for the promotion and development of personal and social skills, organised and promoted by the University of Porto, through its Support Services for the Promotion of Employability and Careers, with the support of the Amadeu Dias Foundation and the FPCEUP's Unit of Psychology of Organisations and Human Resources (UPORH).</p>
Aim / objectives	<p>It aims to provide the participants with competences and tools for a successful integration in the labour market, being composed, besides the WORK SOFT SKILLS module, by the modules:</p> <p>UPgrade Explore Soft Skills - module composed of 5 sessions/lectures on skills and the process of transition to the labour market, aimed at students of all years and study cycles and alumni of the U.Porto</p> <p>Upgrade Improve Job Skills - module composed of and sessions aimed at improving skills and the use of tools to promote the employability of participants. Aimed at recent graduates of the U.Porto (up to 1 year) unemployed and students of the U.Porto.</p>
Target group	Final year students and recently graduated students
Strengths / challenges of practice	N/A
Link / available online source	https://sigarra.up.pt/flup/pt/noticias_geral.ver_noticia?p_nr=129443



5th practice:

Title of practice / initiative	ENGINEER YOUR FUTURE
Responsible organisation / educational institution and contact person	Faculdade de Engenharia da Universidade do Porto
Short description	The programme is a partnership between FEUP, Ernst & Young and Unlimited Future and will focus on the development of soft skills, which are increasingly

	valued by the labour market, and on strengthening the skills valued at the start of a career.
Aim / objectives	The aim is to offer a programme of continuous personal and professional development and provide integrated learning with themes that complement each other. It is intended to empower FEUP students with new skills that, combined with their academic training, will make them highly talented professionals aligned with the needs of the labour market.
Target group (if it is targeted towards students or professors)	5th year students
Strengths / challenges of practice	<ul style="list-style-type: none"> • Well structured • Good partnerships (Unlimited Future, COOP; EY)
Link / available online source	https://sigarra.up.pt/feup/pt/noticias_geral.noticias_cont?p_id=F1138294760/RegulamentoEngineerYourFuture.docx.pdf

Summary of desk research key findings:

Overall, taking into consideration all identified trends, challenges and good practices about soft skills' embeddedness in STEM academic programmes in each participating country, the following table provides a synopsis of the key points of desk research activity:

Opportunities – positive steps	Challenges- barriers
 <p>Existing promising practices from various fields (medical science, engineering studies, schools of science and technology) – however, a minority of the mapped universities focus on the integration of soft skills in STEM curricula with a green orientation</p>	 <p>Soft skills' development is often part of optional project-based courses, not part of the official curriculum or as core course in most STEM fields. Lack of time to introduce changes in the structure of STEM courses</p>
<p>Progress from some faculties regarding the integration of soft skills through online training (e.g., MOOCs) or participatory activities (e.g., role playing)</p>	<p>Lack of institutional support & shortages regarding practical experience from academic staff's side to integrate such skills into the courses of STEM programmes and their field</p>
<p>Existing innovative learning frameworks (such as the TASC learning framework in Italy) are a good reference point and proposal for the promotion of thinking and problem-solving skills.</p>	<p>Almost in all countries, the identified STEM curricula are designed under old-fashioned teaching approaches. Need for a modernization in the agenda and topics of STEM curricula in the area of skills' development.</p>

	Lack of motivation and standardized training for professors regarding soft skills or improvement of their didactic skills.
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The remaining two parts of Chapter 4 (sub-chapters 4.2 and 4.3) focus on the analysis of collected primary data from interviews and surveys respectively that were carried out in all countries for identifying further gaps, needs, preferences on soft skills training in STEM green education and in green economy areas.

4.2 Step 2: Assessment of existing skills shortages in STEM curricula

Sub-chapter 4.2 is dedicated to the analysis of qualitative data that partners collected during the semi-structured individual interviews. The target groups that were reached out and invited by the consortium are **STEM educational providers and stakeholders from green industries** (e.g., employees, employers), coming from various areas of green economy and representing different positions (with most of them having over 5 years of experience and holding a senior position in their organization). Indicative fields of green economy from which partners invited participants as interviewees are: circular economy, green/ smart energy, waste management, marine industry, refining industry, green infrastructure, power plant industry, water treatment, energy efficiency, green architecture, recycling, solar panel engineering. Regarding the academic profile of STEM educational providers from all countries who were engaged in interviews, the majority of staff teach both in undergraduate and in postgraduate level, with a variety in positions they hold at the university (professors, 1 Vice-dean, head of master programmes, scientists, lecturers) and in the years of their teaching experience, ranging from 2 to 24 years of experience. Regarding their areas of expertise, the fields most of them come from are the following ones: Engineering as the primary and most common field in all countries (environmental, chemical, spatial, construction, computer & electrical) and next other STEM fields such as Biology, Chemistry, Renewable Energy, Informatics, School of Design, Agronomy & Geonics.

The SOFTEN partnership conducted in total **57** interviews: in more detail, **26** interviews were conducted with STEM educational providers (professors, assistant professors, lecturers, etc.) and **31** with green industry stakeholders. The main goal of interviews with both groups was to identify current shortages and needs about the integration of soft skills in STEM green curricula, as well as demands on soft skills from the side of green economy sectors. In addition, the collected information helped the consortium understand better the perception of both groups about the benefits and role of soft skills for professional development of STEM graduates, as future and potential employees in green economy sectors.

Before proceeding with the analysis of interview findings, it is important to mention that before starting the analysis of interview findings with the invited stakeholders,

detailed guidelines were prepared and shared among all partners to effectively execute their research activity. Moreover, a reporting template was designed for facilitating all partners to gather and organise their findings in a structured way as well as a consent form that was addressed and distributed to each interviewee before the interview, accompanied by an invitation letter that explained the scope and the duration of the interview. Regarding the structure upon which the questions of interview guide was based, an open-ended format was selected as the optimal tool. For the questions of both groups a same strategy was followed, including an introductory part, a main part, and a closing part. The introductory part was common for both stakeholder categories and included questions related to:

- 1) their level of familiarisation with the concept of soft skills,
- 2) their opinion about the critical role of soft skills for supporting green transition,
- 3) their perception about the opinion of other professionals or colleagues from their own workplace on soft skills' importance, either inside or outside academic area.

These three types of introductory part were selected as 'ice-breaker' questions and were posed in a form of rating under the scale of 1 to 5 (where 1 means the lowest level of familiarity or importance and 5 the highest level of the familiarity, importance, criticality respectively). Given that these questions operated more as warm-up questions, it was not compulsory for partners to ask all of them; therefore, each partner was given flexibility at the beginning of the interviews. Table 6 presents the average ratings of responses of interviewees for each country regarding the warm-up questions. It is worth mentioning that **as compared to educators' opinion, most interviewed representatives from green companies are relatively more aware of soft skills** and the latter's connection with the green transition, with the highest rating being recorded in Finland, Greece and Italy. On the other hand, educators in Italy are well-informed about the concept of examined skills, while in terms of the relevance of softs skills with green content and process, Finnish educational providers show (on average) the highest rate and the Lithuanian educators the lowest one.

TABLE 5. RATING OF PARTICIPANTS ON INTRODUCTORY INTERVIEW QUESTIONS (ON AVERAGE)

Target groups	Level of familiarity with soft skills	How much important soft skills are considered for other professionals?	How much critical are soft skills considered for green transition and green companies?
STEM educational providers	FI: 4,4 EL: 4,3 IT: 4,8 LT: 4,1 PO: 4,2 PT: 4,0	FI: 4,0 EL: 4,3 IT: 5,0 LT: 3,1 PO: 3,9 PT: 4,0	FI: 4,8 EL: 4,1 IT: 4,2 LT: 2,5 PO: 3,6 PT: 4,5

Green industry stakeholders	FI: 4,6	FI: 4,6	FI: 4,6
	EL: 4,6	EL: 4,6	EL: 4,0
	IT: 4,6	IT: 4,3	IT: 4,7
	LT: 3,3	LT: 4,4	LT: 4,2
	PO: 3,5	PO: 4,3	PO: 4,0
	PT: 3,8	PT: 3,8	PT: 3,6

4.2.1 Interviews with STEM academic staff – cross-country analysis

The main part of interviews for STEM educational providers includes three categories:

- ❖ **Category 1:** Level of integration of soft skills in the curricula of their department or school, level of their awareness about any initiatives or good practices focused on soft skills in relation to green transition, soft skills that are considered critical for STEM, green-oriented curricula.
- ❖ **Category 2:** Discovering barriers and obstacles regarding the integration of soft skills in their STEM department or university in general.
- ❖ **Category 3:** Understanding driving factors for soft green skills development in STEM curricula – alternatively: suggestions or ways through which soft skills of students and of STEM young graduates could be enhanced to adapt to a green economy work environment and support the green transition.

Category 1: Current situation and level of awareness on soft skills integration Finland:

The group of Finnish educational providers who participated in the semi-structured interviews offered some worth mentioning information and insight about the current status and level of integration of soft skills in STEM academic programmes in Finland. To begin with, according to participants' opinion and experience it is generally observed that soft skills are included and **well-presented in many study units and teaching/learning methods**, to a smaller or bigger degree. In practice, this is usually implemented via practical or interactive activities (such as projects, group work, field work, online learning) or even courses dedicated to specific soft skills (e.g., professional digital communication, conflict management). However, the level of integration of such skills in most technical fields and departments remains **very broad** and it often depends on the way the curriculum of the programme is organised. Indicatively, as mentioned by an interviewee: *'a communication/leadership course which is 1 ECTS and is offered to all faculties across the university may be compulsory in some faculties while it is not in others'.*

Regarding the existence of good initiatives which their university run or in which their department is engaged, two interesting cases provided by professors whose expertise is around sustainable development and green transition are worth being mentioned. The first example is an innovative educational framework focused on engineering education and real-world demands on engineers which is called 'CDIO

Initiative⁷. One of the main characteristics of this framework is the integration of learning of professional skills such as teamwork and communication. As stated by that interviewee who teaches at Turku University, this framework makes possible to point out personal skills and is integrated in several STEM studies of the university. A second example regards a specific project learning environment called '*Circular Economy 2.0*'⁸, again originated from the Turku university. It is one of the operating methods of Turku University of Applied Sciences (TUAS) that is based on innovation pedagogy strategies, on problem-solving project work and includes real-life projects with green companies. This example represents a learning environment where soft skills can be better nurtured, especially team working and presentation skills. Further, students get an extensive view of the different stakeholders and their interests.

Greece:

When it comes to the Greek academic environment, it seems that the development or training on soft skills is not established in a very institutionalised way according to most Greek interviewed professors. This leads to an evident lack of interdisciplinary initiatives in the learning environment of STEM courses and consequently in programmes related to sustainability and green economy. Very often any existing practices or initiatives focused on soft skills slightly go beyond the traditional teaching methods (e.g., interactive classrooms, presentation of projects) and even though soft skills are considered very important by the interviewed academic staff who represents different areas of expertise, it seems that such skills are not institutionalised for being effectively embedded in technical study programmes. Regarding good initiatives in Greece, an initiative that was pointed out by one interviewee from the Chemical engineering field is the existence of lifelong learning centers. These centers have been established in Greece and can offer the opportunity also for STEM students (or graduates) to acquire soft skills through interdisciplinary approaches and seminars. However, it was strongly supported that such initiatives need to exist in tandem with policy changes in the universities. Another educational provider who teaches in the School of Spatial Engineering mentioned that she is aware of initiatives that encourage the interaction of students with guest speakers, often from the green industry. An additional practice that helps on soft skills development relates to internships that students can be offered as opportunity to participate while studying, although not established in each study programme.

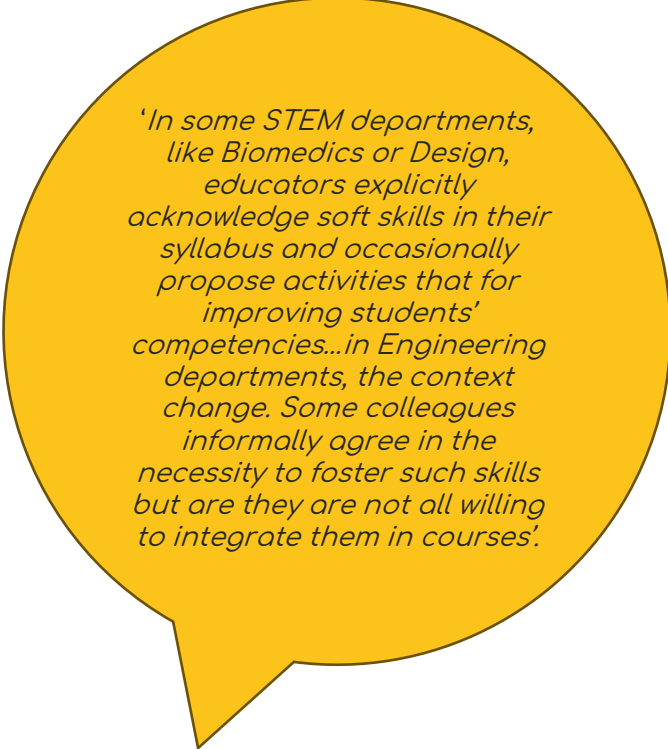
Italy:

Italian educational providers seem to be **well-informed** about the concept of soft skills and their importance for students' career in different departments and schools. For example, it was mentioned that in the School of Design from the

⁷ For more information, you can visit the following link: <http://www.cdio.org/cdio-vision>

⁸ For more information about the method, you can visit the following link: <https://www.circulareconomyclub.com/organizations/turku-university-of-applied-sciences-tuas/>

Politecnico di Milano that that the didactical approach to design is based on **project-based learning** and often the application of soft skills is implicitly required to students while attending courses and laboratories, as they are asked to collaborate in teams, co-organize activities, coordinate their peers, etc). In this case, students can be trained more easily to soft skills required in the contemporary labour market. Concerning exiting problems that hinder the soft skills training with a 'green orientation', Italian educators gave emphasis on **lack of structured initiatives** and agreement among faculties in advancing the role of soft skills, **difficulty of integrating soft skills in didactics** due to **shortages in teaching hours**, **lack of teachers' competencies**.



'In some STEM departments, like Biomedics or Design, educators explicitly acknowledge soft skills in their syllabus and occasionally propose activities that for improving students' competencies...in Engineering departments, the context change. Some colleagues informally agree in the necessity to foster such skills but are they are not all willing to integrate them in courses'.

With regards to current initiatives, it was mentioned by a professor of the Politecnico di Torino that at university level there is a teaching and learning centre devoted to innovative didactics. However, it is more focused on integrating technology and digital tools rather than on including pedagogical approaches that are oriented towards soft skills. Also, it was stated by an associated professor from the environmental engineering field that in the structure of her course they experiment a team project activity, with a final presentation done by each team and accompanied by a peer assessment method. In this way, students are supported in practising specific soft skills such as teamwork, communication, and self-organization skills.

Lithuania:

STEM educational providers from Lithuania expressed mixed opinions regarding their understanding, awareness and experiences about soft skills and their connection to green transition in STEM curricula. Most of them stated that they have a general good level of understanding, yet in a broad sense, about soft skills but they all find soft skills relevant to STEM education and useful for students' personal development and future career. As characteristically stated by a professor *'STEM students are very critical regarding soft skills... future team members and leaders would expect them to be able to communicate, have critical thinking, be a leader and so on..'*

Regarding the soft 'green' skills, most educators indicated that further explanation is needed as it they have not experienced it in their university. Although in some institutions the soft skills inclusion in STEM curricula is generally supported, this is

often promoted as a statement and in fact it is not reflected. There are a lot of statements about the importance of soft skills, however, the administration in STEM faculties still looks down on social subjects and courses, so this **connection of soft skills with green transition needs time and further steps** from the academic community.

At practical level, the current level of integration of soft skills varies and it **depends on the field and department** the interviewee academic staff comes from. For example, a female interviewee from the field of environmental engineering shared an example from her work with fourth-year BSc informatics students who are engaged with innovative methods, like group work activities, design thinking tasks, etc. With this example she supported that such kind of initiatives help, among other, open up silent and individually working students. Another educator, this time from the production engineering field, stated that in general in his academic area around 10% is dedicated to soft skills integration. However, in his department there is an effort to apply a very wide range of teaching methods for soft skills development (like the application of interactive surveys on platforms such as Padlet, Kahoot, Mentimeter, innovative methods such as Design thinking, case analysis). A third interviewee argued that in the STEM study curricula in which he is involved from the field of construction engineering, the part dedicated to the development of soft skills is between 20-30%. In some study programmes, this percentage could go up to 50 per cent. The same interviewee asserted as well that the situation is getting better since university's social partners complain less about the lack of social skills among students who study in one's courses. This situation is gradually improved nowadays in comparison with what these academic partners were stating several years ago where their approach or way of teaching was not so open-minded.

Poland:

From the side of Polish educational providers, some common points were observed with the shared opinions of Greek interviewees mainly in terms of the level of integration of soft skills and the approach that STEM curricula follow. In general, **Polish educators who participated in the interviews corroborated the importance of soft skills for the professional career steps of STEM students in green fields.** However, the main problem relates to the fact that, despite the interviewed professors and a part of their colleagues are in favor of integrating soft skills courses as mandatory courses in university curricula, **no wide attention is paid from the academic community on how this can be better applied and achieved in combination with hard skills knowledge.** Methodologies such as group work or "problem-based learning" techniques are not explained or taught in depth in STEM academic curricula. They happen in a natural way and are often applied at university level haphazardly and consequently in not an institutionalised way. Another observation pertains to the **difficulty to measure the level of integration** of such skills. As it was suggested by a professor: *'I think it would be helpful to have teaching tools to determine or measure the level of development of soft skills among students...this would allow the student to assess and see which skills they still need to work on'*. Most professors affirm that STEM students are interested in developing

soft skills at a high level, as this facilitates group work and course delivery (e.g., task division, ability to convey information). However, it seems harder for academic staff that is not familiar to teach about such skills to determine whether soft skills of students are at a high level or need further improvement.

From the overall findings it seems that the **level of integration of soft skills at Polish STEM faculties varies and it depends on the personality and motivation of teachers as also on their specialization at the study programme.** In some cases, there are dedicated optional courses (e.g., team management skills for the construction industry, where the student takes on the role of a construction manager/engineer to examine an issue from a different position/ perspective). Moreover, the syllabus of the course is crucial because the educational staff must follow it in line with the teaching process. They can introduce or suggest new interdisciplinary activities that will improve soft skills but there are no formal guidelines or institutional solution to these issues or pressure to introduce such skills to teaching. Additional factors that were underlined and contribute to the low level of soft skills integration in STEM education are: 1) not all professors are involved in the development of curricula and 2) there is a tradition in technical universities to be oriented towards the transmission of strict knowledge in hard sciences. As clearly stated by an interviewee: *'In my department (engineering and technical faculties), the level of integration of soft skills is very low. Soft skills are not included in the curricula. At the first degree, a student can choose for himself/ herself one or two optional subjects from the humanities area...however, these are elective courses and not compulsory.'*

Regarding running initiatives that are initiated from STEM educators or the whole department, several intriguing examples were reported. A first example, mentioned by a lecturer who takes over a course on circular economy, regards an initiative that focus on a working group that has been established on May 2023 at their university. This group is planning to create the "*Laboratory of Innovative Didactics*" and from the next year (2024) this group will be trained to the maximum in soft skills and will participate in international conferences. There are dedicated financial resources to train these people and then transfer useful knowledge. In addition to that initiative, in the context of the previous circular economy course it was mentioned by the interviewee that every student has to prepare a presentation. In this presentation, students are asked to include recommendations and business ideas, and the scope is not only to prepare a presentation or just only read from slides but also to practice additional skills in an interesting way. In addition, each student must ask a question for this presentation. Students have to come up with a theme that will captivate the room. This is related to the competences that they need in future environments under the prism of green transformation, as they will need to look for ideas on how to convince other people to their ideas.

Portugal:

According to their own experience from Portuguese STEM academic ecosystem, many engineering courses already integrate soft skills, mainly around

organizational communication. They are considered to have a transversal role to all curricula. Although the openness and integration of soft skills are quite spread, some critical barriers have not been overcome yet. As mentioned by one interviewee, at a master's degree level in ISCAP (in English: Porto Accounting and Business School) there is an integration of soft skills geared towards a green transition in the industry in the programme of Health and Safety in the Workplace. Another experience that was shared by a second interviewee is that some lectures find soft skills secondary competences as they follow a traditional approach, by mainly focusing on hard skills. Nevertheless, regarding bachelor's study programmes in STEM fields, it was mentioned that every course has a programme called "Personal Development" which aims to teach and engage students regarding soft skills. The same professor who shared this experience tries to integrate these skills in his courses by always including oral presentations and group work in order to engage student in soft skills that are much needed for several contexts. **Regarding students' side, it was mentioned that students only understand the value of soft skills after leaving university.** Skills like leadership and communication are often seen as valuable by students after getting into the job market and companies. Hence, **students seem to be more interested in soft skills in academia curricula when it comes from more practical workshops and courses.**

Before closing the analysis of the 1st category of main part, it is important to note that the soft skills that were considered as the most critical ones for green transition and students' development from all participating countries are: **adaptability, active listening, teamwork, group empathy, collaborative skills, critical thinking, problem-solving in new technologies and green transformation, self-motivation, communication skills** (as many STEM graduates will need to collaborate in the future in interdisciplinary and transversal teams to face the challenges toward the green transition) with a particular attention to intersubjectivity, ability to assess risks and counteract, organisation skills, improvement of systems thinking skills, cognitive flexibility, emotional management.

Category 2: Discovering barriers for soft skills green-oriented training in STEM studies

Finland:

The Finnish interviewed academic staff emphasized on the following barriers that negatively affect the integration of soft skills in their STEM department or university in general:

- Some professors/teachers/lecturers still **use traditional ways of teaching** and may be **reluctant** to change their approach to teaching.
- The poor level of teachers' skills and attitudes to teach or approach a hard science differently.
- Lack of proper listening and dialogue between professor and students. Major problem is that students are so tied up with daily life (family, work, studies) that they focus on their main subject areas and can neglect soft skills, not thinking too much about them while studying therefore not reflecting enough on this aspect of their studies.

- The way soft skills competence development is integrated varies from one faculty to another. It can represent 8 ECTS in a degree programme while 27 ECTS in another. It is really depending on the degree programme.
- Lack of motivation from educators' and students' side to embrace interdisciplinarity – there is an over-emphasis on their own know-how and stick to their field /plot too much. Several people as academic staff are too attached to old methods and do not communicate and listen.
- Lack of interest in following up new ideas. People often are very focused on their current situation and their own field. They are sometimes tired /unmotivated to learn new ways to work with.

Greece:

From the Greek side, Lack of resources, lack of common organisation and cooperation between different scientific fields. Some of the barriers that are presented below are similar to the suggestions of the Finnish staff but are worth being noticed also from different stakeholders:

- Lack of flexibility in order to integrate such training materials. The way the curricula are structured may be a challenge for educators as they cannot be flexible to integrate effectively and within a sufficient time training on soft skills or dedicate time on their connection with green thinking and transition to a sustainable future.
- The large classroom size. Soft skills' development is hard when classroom sizes are larger than 30 students. It can be as simple as being able to participate in the lecture. Another challenge or obstacle is the professorial workload.
- Update of university policies and strategies as a whole. Regarding green transition and green soft skills, it was proposed that teaching on soft skills in a green context needs to be correlated to the University's general approach to sustainability.

Italy:

Italian education providers mentioned some common limitations with educators from other countries. The observed similarities regard mainly the **great amount of time that is usually needed to re-think/re-design a course** or just a part of it to integrate soft skills development and to the **lack of teacher training** on how to integrate soft skills development in STEM courses. This would be crucial to explicit the importance of such skills and offer teachers concrete hints and ideas about what to do with students to improve their soft competences.

Other crucial factors that were reported as limitations are the following ones:

- **low consciousness** about the crucial importance to prepare students to the labour market
- **not sufficient collaboration / interaction with companies and private sector** to make aware their needs in terms of soft skills
- **unwillingness** of the side of educators to approve the idea of considering soft skills as a subject to be 'added' to the specific discipline of each teaching.

- **lack of awareness by university government levels** able to promote structural initiatives that can incentivise teachers to experiment also through some rewards (in terms of visibility and/or funding). This is a crucial element for stimulating teachers in investing time and effort in re-thinking their course approach and structure.

Lithuania:

According to the Lithuanian interviews from the academic side, the most crucial gaps that cannot effectively support soft skills to be integrated in their STEM area need to be mentioned, as follows:

- **Existing traditions and the status quo in STEM curricula** – this is also linked to the educators' culture and behavior.
- The **university's administration** could play a critical role in supporting or in the opposite hindering application of soft skills.
- **No clear institutional or state-level strategy** is implemented to support green skills, with the involvement of soft ones, integration. Soft skills are included in the curricula but need to be strengthened with more direct initiatives. The factor of state that was mentioned is a common point with the Greek situation.
- Soft skills are encouraged to be implemented in the curricula, but **no pressure or motivation** is given to do so.

Poland:

The main limitations and problems that hinder the integration of soft skills in STEM programmes in Poland are related both with personal factors and with institutional or financial issues. These obstacles regard the following factors:

- **Narrowed approach of educators** in the sense that some of them do not allow free factual discussion in their classes and only allow authoritarian solutions. Consequently, **no sufficient time or attention are devoted to organise or manage activities or dedicate sessions on soft skills** as they are outside of their typical expertise.
- **Too much teaching and research workload**, which does not leave enough time for professional development on soft skills in general and specifically in the context of the green economy.
- **The existing lack of academic leaders** who can operate as mentors and teach to students that soft skills are important also for the green transition especially in STEM areas leads to the unpreparedness of students due to their lack of soft skills. Therefore, there is an **obvious need for qualified trainers and teaching staff** to impart this knowledge and skills.
- **Incorporate dedicated tools for developing soft skills through teaching methods.** In turn, this can create new opportunities for embracing and putting into practice the interdisciplinary work, where skills and experience from multiple industries can be exchanged and combined.

Portugal:

The limitations and barriers that were reported by Portuguese academic staff are related to:

- As already stressed also by Italian educators, the **lack of training of professors on soft skills** and the fact that many educators today tend to keep study programmes and their courses outdated render the overall academic ecosystem more rigid.
- the backwards thinking that values too much tradition instead of innovation in academia. As pointed out by a professor: *'Only after outside feedback and evaluations educators can be more open to include soft skills in their curriculum...'*. Therefore, educators themselves can function sometimes as the biggest barrier because of their own system in the teaching process that may have never included soft skills and second to the fact that they are not motivated or engaged in updating themselves on their subject and include new competences important for 21st century.

Category 3: Understanding driving factors for green soft skills development in STEM curricula

Finland

The Finnish educational providers offered a variety of useful and critical suggestions as driving factors to integrate soft skills in green-oriented STEM curricula:

- ❖ Need for process development to turn ideas into solutions. In addition to that, an ability to change and be flexible. As an example, changing a lecture/exam-based course into a more case study/teamwork course where students can practise soft skills in a more authentic environment.
- ❖ Finding balance and complementarities between hard and soft skill courses.
- ❖ Enhance teamwork, cooperation, and peer learning among teachers.
- ❖ Showing and **sharing good examples and practices**, even from a different faculty or academic field.
- ❖ Create an impulse towards the integration of soft skills from the **university strategic management level**.
- ❖ As the needs from the working life change all the time, **collaboration between faculties, in line with more funding opportunities**, are essential towards creating an extra impulse.

Greece:

The Greek educators focused from their experience, needs and limitations they mentioned, on the following ideas:

- ❖ Establish a **strategy that facilitates the development of soft skills** – an indicative example as idea is the process of students' internship during their studies in green companies. The **internships** offer students the opportunity to interact with employees, by practising multiple skills such as thinking new ideas, adapting to new

environments, improve their communication skills, gaining confidence and becoming more engaged in new practical knowledge. There is a need for an organized strategic plan on how to integrate these skills that will be so necessary in the near future.

- ❖ Empowering and engaging with the student body and **promote student led initiatives**, like university clubs that are involved in green economy topics and their own self development. This can be achieved also through outreach to other institutions, both at national and international level.
- ❖ **Interaction of universities with community and industry** (e.g., industrial – research PhDs is an initiative in some STEM faculties).
- ❖ Invest in **working group activities** that can foster soft skills also in technical topics
- ❖ Organise **role-playing activities** in specific courses, where relevant, especially those focused on sustainability and environmental challenges.

Italy:

The Italian interviewed academic staff paid particular attention to the following factors:

- ❖ Offering training for **university teachers** or at least, **events** (like workshops) or **useful toolkits** to be used directly by teachers. An idea by an interview is to extrapolate some “best practices” from the experience gained in her course of “Engineering empathy” to be shared among colleagues with the idea to be applied in their courses.
- ❖ Acting on **structural initiatives at university level**: e.g., updating indicators based on which the course quality is defined to include some reference to soft skills. In this way, teachers can become more conscious about soft skills and can be better urged to think about this issue when designing activities/courses.
- ❖ Receiving **feedback from students**: if they experiment positively an activity during class and have the possibility to transfer a good idea to the teacher, he/she should be motivated to invest in this direction.
- ❖ **Integration/collaboration with external experts** and realities that comes from job market.
- ❖ Ensure **dedicated budget to invite external experts**.
- ❖ When introducing new activities/approaches in a course with the objective to reinforce soft skills, it is important to strongly **accompany students**, e.g., by explaining what they are asked to do, how to sustain the value of the initiative through scientific literature, etc.

Lithuania:

The Lithuanian educational providers put much emphasis on the institutional factors and resources from outside university for pushing the embeddedness of soft skills in STEM curricula with a green orientation. Below there is a summary of the most important suggestions as driving factors:

- ❖ Receiving **feedback from social partners** – this can push the administration of academic institutions to proceed to the implementation of interactive, inclusive teaching methods.
- ❖ Establishment of **organised initiatives** that can improve the current status of **institutional management** or **initiatives with a policy-level guidance**. These ideas are a strong driver to start implementing green skills in STEM curricula by including elements of soft skills and their philosophy. This can also be combined with financial motivation that needs to be further considered.
- ❖ **Examples from industries** help to convince educators to integrate soft skills, despite partial students' disapproval.
- ❖ Create effective **support systems** (including the administrative support and the university's infrastructure) to facilitate more easily the uptake of interactive and inclusive teaching methods. This can be also useful for young educators that now join **educators' team**.

Poland:

The Polish academic staff presented similar ideas with Italian and to some extent with Greek educators, with main focus on platforms and interactive activities that can enhance the soft skills integration. The points that worth being mentioned are related to the following factors:

- ❖ Creation of **online tools** like an e-learning platform on which there would be training, for example, on development of green soft skills.
- ❖ Participation of **educators and of students in soft skills training**. Introducing mandatory soft skills courses taught by qualified professionals in the field.
- ❖ **Interactive and practical workshops** using dedicated tools in combination with training for academic staff.
- ❖ **Change of the behavior, attitude, and mindset** of employees regarding soft competencies.
- ❖ **Academic exchanges with other countries** (gaining experience from others). Organization of summer schools, where, for example, students study soft skills in a foreign language for a week. This is a common point with one of the Greek educators' ideas.
- ❖ **Sharing good practices and inviting practitioners from the green economy** to the didactic classes, who can show and discuss real examples related to their professional experience.

Portugal:

Portuguese educational providers provided their own interesting ideas that could bring a positive change in their university to embed soft skills in connection with green transition in their faculties. The most interesting suggestions are showcased below:

- ❖ STEM faculties could be better aware of the impact of EU-funded. This can operate as a key to ignite the interest of universities and of STEM departments to promote soft skills in academia.
- ❖ A gradual change should be enabled by the **management side of a department of a whole university**. Soft skills are transversal to all scientific areas, (including STEM areas) and this advantage needs to be better communicated to students and academic staff.
- ❖ Offer an **impulse from European and National bodies** is needed, while the creation of actual budgets for the integration of teaching soft skills is an additional enabling factor that should not be underestimated.
- ❖ Improve **students' understanding of the real world and job market** right after the beginning of their studies so that they can deep into the need of cultivating soft skills as early as possible apart from their core studies and technical know-how.

Summary of key findings of interviews with STEM academic staff:

Category 1: Level of integration & awareness

- 1) Not the same level of integration in all countries - soft skills competence development varies from one faculty to another (e.g., in Finland & Italy soft skills are included and well-presented in many study units and teaching/learning methods).
- 2) Lack of structured initiatives in teaching soft skills with 'green' topics
- 3) The connection of soft skills with green transition needs time and further steps from the academic community.



Category 2: Most critical barriers

- 1) No clear institutional or state-level strategy to support more inclusively green skills, with the involvement of soft skills' integration
- 2) Lack of teachers' training
- 3) Poor motivation and dedicated time to soft skills teaching in courses' syllabus
- 4) Reluctance from educators in changing teaching methods and embrace interdisciplinarity through innovative learning units
- 5) Lack of resources & limited cooperation with private sector or stakeholders outside academia



Category 3: Driving factors for green 'soft' skills development

- 1) Support from university's or department's administration to integrate new initiatives in STEM 'green' curricula
- 2) Sharing good practices between faculties & invite practitioners from green companies to introduce real world cases
- 3) Need for an organised strategic plan within academic STEM curricula
- 4) Invest in group activities in technical topics & offer specialised trainings for educators through workshops & useful toolkits.



4.2.2 *Interviews with green industry stakeholders*

For the green industry stakeholders' interviews the main focus was again on three different categories, with slight differences with the above presented ones, as follows:

- ❖ **Category 1:** current needs of soft skills in green economy. At this category the main focus is on the most important **skills** that a new employee (with STEM background) should have in their 'green' sector in order to succeed and adapt to green transition.
- ❖ **Category 2:** exploring **gaps** and how these gaps influence the adaptability of employees to sustainability & green processes.
- ❖ **Category 3:** existing initiatives and **benefits of soft skills** for cultivating a more inclusive green mindset.

Category 1: current needs of soft skills in green economy

Finland:

Finnish green industry stakeholders expressed their high interest and appreciation for the connection of soft skills with green transformation and personal development of their employees, especially those with a STEM background. As their working environments are versatile in terms of employees' profile in the sense that there are variables such as age, educational background, scientific expertise, there are very many different views on green transition and sustainability and therefore in how they approach or are engaged in new skills' development. From their own perspective it seems that on average they consider as very important the cultivation of soft skills and it is believed that they can influence the portfolio of their company. Regarding the skills that were distinguished as very important for the employees of their sector in order to adapt to the green transition and demands of their working environment, most interviewees highlighted that it really depends on the nature and requirements of their work and position. For example, an interviewee from the refining industry noticed that in their sector the **'out of the box' thinking, effective communication at many levels** (communicating the right 'sustainability message' in a clear and convincing way to create an impact), **open-mindedness**. Other skills that stood out are the problem-solving skills, goal orientation, teamwork, change management.

Greece:

All interviewed Greek stakeholders from green industry, irrespective of their expertise, claimed the **value and importance of soft skills**, although they are not viewed as the only critical skills for the green transition. It is believed that soft skills should be combined with hard skills and technical know-how.

The categories of soft skills employers distinguished as the most critical ones for the green economy and specifically for their sector are: **collaboration, adaptability, creativity** (as it is messaged via efficient and productive work), 'leading by doing', synthesis skills as the ability to combine knowledge and information through critical

thinking, risk management. **Negotiation skills** are also critical according to a director from the field of environmental engineering; these skills evolve with an employee's age and it was mentioned that by developing good negotiating skills is a dynamic process. Last but not least, two more soft skill are worth being mentioned: 1) the **prioritization of tasks**. As an anecdote the interviewee shared that many times in her company they had to implement the 'Eisenhower Matrix'⁹ in an effort to develop this skill to their employees. 2) **Project management** skills. In order to reach our goals till 2030 that require the on-time delivery of small to medium sized projects that relate to green energy (be it smarter grids, microgrids, upgrading the existing infrastructure etc.), a STEM employee today needs, apart from this technical know-how, good project management skills so that projects are timely and effectively delivered avoiding employee's burnout.

Italy:

For Italian stakeholders, soft skills are, as it was observed in other previous countries, **crucial in all sectors** and especially in innovative sectors. The 'green' culture is nowadays very trendy and although social skills (part of soft skills) are less trendy they can make a difference to change the mindset of STEM employees. Most of the interviewed employers are familiar and aware of soft skills and their benefits, although their connection with green transition is something not much explored until now. The soft skills that were considered by Italian interviewees as most essential are the following ones: **flexibility, active listening, organizational skills, empathy, teamwork** (common point with Finnish employers), agency, the motivation of networking, the capacity to look ahead, **open-mindedness, storytelling ability** (part of communication competences).

Lithuania:

The Lithuanian interviewees from green economy verified with their ratings and their expressed opinions their moderate level of familiarity with soft skills, although a couple of them shared stimulating examples as good initiatives for developing soft skills for their employees with a STEM background. However, when asked about the criticality of these skills towards different approach for the green transition, almost all interviewees strongly supported their essential role. It is believed from most interviewees that in their 'green' sector to succeed and adapt to green transition, the following soft skills are needed today: 1) **flexibility and adaptability to change** according to conditions to adapt to new situations, obstacles and challenges. This can be enhanced with a changing roles method because it helps to understand each other's position and helps explore different contexts and references points, 2) **regenerative leadership** (seeing systems from the regenerative side), 3) **analytical thinking** which could be further leveraged when analyzing legislative documents and trying to find possible solutions, 4) **empathy**, 5) **open-**

⁹ The '*Eisenhower Matrix*', also referred to as 'Urgent-Important Matrix', helps people **decide on and prioritize tasks** by urgency and importance, sorting out less urgent and important tasks which they should either delegate or not do at all. For more information, please visit the following link of the source: <https://www.eisenhower.me/eisenhower-matrix/>

mindfulness to novel ideas and concepts and being able to work in multi-cultural environments, 6) **collaboration** and 8) **relatability** (how to simplify information that would be comprehensible in different settings).

Poland:

From the perspective of Polish green industry stakeholders, soft skills are general considered as critical competencies and important by other professionals in their workplace. It was well-developed soft skills (e.g., negotiation skills, speed of response, the pleasant and uninhibited atmosphere during meetings) affect how a company is perceived in the industry. An interesting finding is that some of the interviewees rated their level of familiarity and awareness about these skills, in connection with green transition, at a medium level. This shows that they are not familiar with practising such skills and this is confirmed also from the findings in Category 3 (good initiatives) of this sub-chapter, as a **minority of interviewees were aware of ongoing good practices** either within their company or as example from a similar working environment in their area of expertise.

The category of soft skills needed for green economy fields that Polish entrepreneurs distinguished are the following: **teamwork** (also mentioned in the case of Italy and Portugal), **communication**, high level of **creativity** and innovation in applied solutions, self-development, ease in completing tasks and focus on the goal, **critical thinking**, **time management**, **ecological empathy**, assertiveness, **conflict resolution**, dealing with stress, **adaptability**.

Portugal:

The majority of Portuguese green entrepreneurs who participated in interviews seem to be moderately familiar with the concept of soft skills, but they think that soft skills are generally valued by professionals of their green technical companies. Although their impact and criticality of these skills for the green transition and the support of their company's portfolio seems to not be the primary factor driving decisions and outcomes – as the rating of 3,6 (on average) by the side of interviewees confirms – this may indicate that while the development of green soft skills is important, other factors such as technical competencies and project execution also significantly influence the company's portfolio. According to their viewpoint, the soft skills that are the most critical for their green economy sector are the following: 1) **Critical thinking**, as it is crucial to possess the ability to think independently and make sound decisions, 2) **Ethical and social awareness** (this competence seems to be similar with ecological empathy mentioned in Polish findings), 3) **teamwork**, 4) **problem-solving** as it helps overcoming hurdles encountered during wind turbine projects, 5) **effective communication** that is essential to engage with stakeholders such as team members, higher management, clients, regulatory bodies, and the community, 6) **adaptability** (as it is crucial to keep up with the rapidly evolving renewable energy sector, including adopting new technologies and adjusting to changing regulations), 7) **leadership**. The last two soft skills (**adaptability** and **leadership**) are regarded essential for individuals entering the renewable energy

business in order to flourish in the continuously expanding industry and contribute to the successful implementation of green initiatives. These abilities and characteristics are regarded as critical for achieving success in the green transition, making important contributions to a more sustainable future and navigating the challenges and requirements of the green sector.

Category 2: limitations and gaps regarding employees' soft skills

Finland:

Finnish stakeholders from green companies highlighted that existing **limitations and gaps often depend on each employee's personality**. However, it was observed that the following 'skills' gaps exist in various fields and companies under the green economy area:

- **Lack of taking risks:** all employees (including those with a technical know-how) are too careful and most times cautious because they are afraid of the mistakes.
- The ability of **sharing and distributing knowledge is not well-developed** or practised. As mentioned by an interviewee *'if someone takes an interesting course and learns from it, maybe people could be more active in sharing that knowledge'*.

When it comes to the question on how these gaps affect the adaptability of STEM employees, some stakeholders seem to be more active and some more passive regarding their response towards their employees' soft skills in connection to the green economy goals. Nevertheless, there is a consensus that new knowledge on transversal skills (or soft skills) should be spread within an organisation or a company and are essential for sharing perceptions (where we are, what we do) and visions (where we head). Another critical highlighted point is that a new employee should be open to new opportunities and for this reason some soft skills like innovative thinking or the open-mindedness are more than significant, especially in technology area where a new idea can be scalable and being further invested. In some areas like the energy sector the situation is changing very quickly in the work and is very groundbreaking. This means that green industry employees should be adaptable and push changes in order to keep the business going on and to be on top of things.

Greece:

From the perspective and experience of Greek stakeholders, they clearly highlighted the **urgency to acquire skills in the context of the new skills' demands for green transition**. The most evident and identified limitations are attributed to factors that relate to **STEM employees' way of thinking and the degree of their flexibility towards new emerging challenges** in their work. The mapped gaps that were provided are the following:

➤ **Lack of recognition** from the side of STEM graduates that this is a pressing matter that has to be dealt with. This is commonly observed in these new employees who believe that just by following their departments' curricula they are fully equipped for their career. STEM graduates focus more on acquiring technical knowledge. In this way, they cannot assess risk appropriately and similarly cannot always critically reflect on how to assess if something in a crisis that needs management and amelioration. For example, if you cannot assess that climate is in crisis then you cannot management climate crisis. Therefore, they are mainly lacking **critical thinking** skills. These gaps affect their ability to adjust and adapt the technical knowledge and skills they have learned into real world problems and needs. Unfortunately, this is exacerbated by the lack of formal soft skills' training in STEM departments which reinforces the idea to a student that they do not need these skills. This is crucial because the green transition does not relate only to people with technical expertise as it actually affects mostly people who do not have a science background.

'STEM graduates tend to think in 'boxes that need to be checked'. This way of thinking does not allow for flexibility and to look at the same problem from a different perspective.'

Director of Greek energy efficiency company

➤ **Lack of an organized, top-to-bottom effort** to develop soft skills, even through joint efforts between academia and green companies.

Italy:

According to the experience from their own environment and working culture, the Italian stakeholders from green economy identified the following critical limitations that as a result influence to some extent the adaptability of an employee in a company:

➤ **new employees are selected based on their qualification** (mainly from the technical degree), not considering any soft skills acquired. This observation is connected also with a comment that was mentioned by a Quality Manager from a company focused on recycling of plastic waste and packaging *'my collaborators have difficulties in organising their work autonomously and effectively. They struggle to carry out different activities at the same time assigning priorities'*.

➤ A part of interviewees supported that the **ability to communicate effectively is very difficult to be acquired**- it is challenge on a daily basis.

➤ Young university STEM graduates, with a very high level of technical knowledge and expertise, often **lack of creativity, ability to organise their work** if it is not strictly procedural, **management of unforeseen events**, design of a plan B, capturing a broad overview of phenomena (including the environmental ones), have analytical observation skills. These skills should be practiced already from the

earliest years of university by taking them out of the classroom and training them in the field.

➤ Difficulties in finding a **valuable training offer** for their staff to reinforce those skills and attitudes that are currently needed internally to achieve company's annual objectives.

The reported gaps have an impact to smaller or bigger extent. Gaps in soft skills development are often observed in practice, although the technical profile of an employee may fit perfectly to a company. This is confirmed by one interviewee who stated that *'From technical-scientific universities, e.g. from the Politecnico di Milan, some very competent engineers work in his company: from a disciplinary point of view, the preparation was unexceptionable, but often, when they moved from technical to managerial roles, gaps related to the management of other people became immediately apparent, so the company had to invest in training and coaching'*. Other stakeholders mentioned that in case they observed any lack or incapacity in soft skills in practice they are open to offer some training on these skills, mainly to improve them through practical experience; however, this training is dedicated to managers and not to non-executive roles.

Lithuania:

From the case of Lithuania, the major limitations that were identified and need to be underlined are the following ones:

- **Lack of ambitiousness** could be one of those problems. This is also observed sometimes in the context of innovation, seeking for more innovation.
- **Lack of analytical and critical thinking** this contributes to more complicated communication, leading to more passive employees. This may have an impact not only in the process, but also in the final result.
- There is **little discussion about soft skills**, as other rather technical matters are often more prioritised and hard skills are often more valued, especially in the environmental sectors. The importance of soft skills is often overlooked, little attention is given towards building good professional relationships. In one of the interviewee's company, having to work with disabled people requires having some soft skills in particular and not having them makes the situation very complicated. It is important to be willing to help others in such situations and it is partly related to empathy.
- In the field of green spaces and urban resilience it was supported that **soft skills are underestimated**, while hard skills are overestimated and considered to be the most important ones.
- There is a **lack of soft skills and understanding of why it is important to have them**. In particular, there is a lack of flexibility and as soft skills are changing little by little they are often considered more like an obstacle in order to achieve some kind of a result. For example, when we design green spaces in cities cooperation or even empathy is overlooked as skills because some believe that it will only cause problems and not practical solutions.

Furthermore, it was stated by an interviewee that sometimes to identify what is the gap or limitation depends on the professional background of the person and his and her role. As it was reported: *'If a company does not declare that everything works through collaboration and empathy principles, then it becomes an obstacle, as, for example, architects and spatial planners look at it as an obstacle. Though when you are looking for a job and if you have soft skills then it is being taken advantage of in the private sector. Respectively in the governmental sector it is not considered to be a disadvantage, although the main attention is still spared to hard tools and skills, while soft skills come as an additional value that the employee could bring with himself or herself.'*

Poland:

Polish green managers and entrepreneurs focused on a variety of current limitations that can hinder the adaptability and productiveness of employees in green sectors. These shortages are attributed both to personal factors but also to institutional or social elements. The most critical gaps are presented below:

- **Lack of desire for self-development and better communication.** Employees are reluctant to interact with new people they meet. In addition, they lack the ability to talk to "difficult customers". The dynamic development of greening requires knowledge of technical innovations and up-to-date knowledge of development prospects and legal conditions.
- **Lack of motivation to work towards a sustainable and green transformation of the economy.**
- **Lack of empathy and understanding for the environment**
- **Lack of proper education and emphasis on soft skills in the educational system, especially in hard sciences**
- **Financial limitations (mainly for small companies)** that cannot facilitate properly and with effective budgeting the organisation or establishment of capacity building trainings on green 'soft' skills. Therefore, the lack of prior training in several green fields limits productivity and adaptation to greening and sustainable development processes as employees are unlikely to adapt and change their minds.

Portugal:

Portuguese green economy stakeholders emphasised on many critical points that relate both to the characteristics of green sector and to skills gaps of employees themselves. The most crucial gaps related to the following factors:

- **Limited awareness and appreciation of soft skills.** Often, individuals with an extensive theoretical foundation tend to overlook the significance of personal and transversal skills. The primary obstacle lies in comprehending and recognizing the importance of a green transition. As a result, we have not yet reached a stage where the discourse on how soft skills align with this transition is actively pursued. Passion: Not all employees in the green industry may have a genuine passion for sustainability.

- **Lack of training and possibility of talent retention.** As supported by most interviewees, the green sector is relatively new and continuously evolving, leading to skill gaps in the workforce. In parallel, it is a highly competitive sector and if green companies do not invest also in professional development of employees not only regarding their technical know-how it is likely that some high skilled employees may be sought after by various organizations. This can lead to lack of effective human resources in a company.
- **Lack of Interdisciplinary Collaboration.** The green industry often involves complex problems that require collaboration across various disciplines.
- **Limited Leadership Development.** The limited emphasis on leadership development programs, leaving a gap in nurturing the next generation of green leaders. Not all individuals in leadership roles possess the necessary skills to effectively manage teams, make strategic decisions, or inspire team members.
- **Lack of adaptability.** Technical workers may struggle to communicate complicated ideas to non-specialists, resulting in communication gaps. Also, some personnel find it difficult to adapt to quickly changing technologies and procedures, limiting their capacity to stay on top of sustainability and greening initiatives. Working in an academic setting, the interviewee cited ethical, social, or environmental issues that can offer ethical quandaries in the drive to create and apply new technology. Difficulty in adapting to the fast-paced nature of the industry, including technological advancements and regulatory changes, may result in resistance to adopting new processes and hinder the advancement of sustainable initiatives. Lacking adaptability hinders the adoption of new technologies and practices necessary for transitioning to greener processes. Ineffective collaboration leads to conflicts and inefficiencies, reducing overall productivity.
- **Limited problem-solving skills.** This can hinder the resolution of technical or logistical challenges, resulting in delays or increased costs. Low resilience in employees can lead to stress and burnout in the high-pressure industry, affecting their adaptability and productivity. Problem-solving limitations can impede the ability to address emerging challenges associated with sustainability and green technology effectively.
- **Shortcomings in ethical decision-making** can undermine sustainability goals, while poor time management can cause project delays and inefficiencies, impeding the transition to greener processes.

Category 3: Initiatives and benefits of soft skills' development in green economy areas

Finland:

Regarding any ongoing, worth mentioning initiatives initiated by their company, 3 out of 5 interviewees mentioned that their company offers a wide range of trainings related to leadership, team building, communication, negotiation for their engineering staff. Another example from the area of waste management where it was reported that the company uses internal mentoring in communication topics. Regarding management of change and sustainable mindset, they have available a variety of analytical tools. In this way, it was supported that the organisation facilitates the improvement of awareness in sustainable mindset as this is seen to improve customer relationship. Concerning the benefits that soft skills can offer in green economy working environments, the most important ones are mentioned below:

- ❖ **Soft skills help being more communicative and convincing other about new ideas.** Besides this, these skills encourage new STEM scientists inspire decision makers to take more risks regarding the development of new products supporting the green transition.
- ❖ **Soft skills support employees to have a strong critical green mindset towards the new developed technologies.**

Greece:

Regarding existing initiatives within Greek 'green' companies, the process of establishing (not just organising occasionally) any kind of trainings is a common strategy with that of some Finnish enterprises. An interviewed director from an energy efficiency-focused company pointed out that *'in our company there is a specific section of the budget that is dedicated to online courses and trainings that aim to support and increase employees' soft skills'*. This method is being applied as strategy by another Greek, green-oriented company that promotes on the job training for their employees. This takes place through **informal peer mentoring where senior employees often mentor and coach younger ones**. An additional, worth mentioning initiative regards group discussions on topics where knowledge should be shared among team members and in cases where there is a very specific and highly detailed topic, they often come in contact with external experts. On the other side, from the part of companies that did not share any initiative from their own environment, the need for such efforts was not overlooked. The last interviewees highlighted that they are aware of several initiatives, but a part of them do not really fit to the size of their company or they do not agree in the way these trainings or other practices are applied, as they are not always interactive. It was also suggested that regarding skills' trainings they should be delivered through more experiential exercises in order to increase the uptake of the soft skills by the trainees. In addition, it was stressed that several ongoing initiatives applied by other companies are not under scrutiny by an official policy or the state or they do not always ensure funding to be more sustainable. As stated by a green company

employer 'such initiatives could either be state sponsored or supported by professional guilds and other professional associations.

When it comes to benefits soft skills can offer, interviewees focused on the following points:

- ❖ Soft skills contribute critically to the development of a healthier and more efficient culture in a 'green' company. This creates a more positive work atmosphere that also benefits the company's economic performance.
- ❖ Soft skills can lead to a change in attitude. Acquiring soft skills especially as an adult can be a humbling process that needs to start by accepting that there is something you do not know and a will to learn it. This attitude comes in contrast with the cultural norm of STEM graduates as experts that have all the answers or should at least have all the answers. By developing soft skills, a 'green' employee learns to be more open to general training and to understand that continuous learning is vital for their own growth personally and professionally. As noted by a green manager '*STEM graduates can often possess irrelevant hard skills which they were taught at university. Therefore, he believes that besides the gap in soft skills there is a significant gap in hard skills*'.
- ❖ By acquiring soft skills, employees build their leadership capacities and could be moved upward in management positions. Finally, there can be monetary gains as well, such as a higher pay.

Italy:

Italian stakeholders provide several interesting and inspiring initiatives that some green companies have initiated for their employees. Indicatively, an interviewee stated that in her company a participatory internal process has been standardized to collect opinions/requests from the whole staff and usually, the management team uses results from this process to identify breakthroughs to work on with training. This is an important step to also help employees with a STEM background being reflective and exercise their critical and analytical thinking. The same company has activated this year specific training initiatives focused on gentle communication and on reducing conflicts, with the provision of feedback as a process to sustain personal growth. In addition to knowledge, technical universities should train citizens who first and foremost have a civic awareness that enables them to fully understand complex phenomena, in order to carry out targeted and sustainable activities.

Concerning the benefits that are developed by green soft skills cultivation, there is an agreement that if people are trained somehow to improve their capacity to catch opportunities, to communicate new ideas, to detect and interpret the complexity of different contexts and create and valorize connections among these contexts, this definitely will bring a lot of benefits in the field of green transition. This can be better achieved through the development of soft skills, because such kind of skills are beneficial at different levels and in front of demands and challenges of every working context.

Lithuania:

The identified initiatives that Lithuanian green industry stakeholders expressed in their interview worth special emphasis. More specifically, regarding trainings that have already been mentioned as practice by other countries, they are sometimes performed in Lithuania as a kind of **online trainings** on project management competence, public speaking or on architect training and the principles of nature ecosystems. This last training would be more about how conflict management takes place in nature, how leadership and collaboration processes are present in nature, while monitoring nature, and not so much about how the plant absorbs water. In these trainings, soft skills are not presented directly, while analyzing them one by one, but the way they are organized is going through different examples and the essence of learning soft skills comes from practical examples in nature. Moreover, the process of mentoring was identified that was again reported previously by some stakeholders of other countries (mainly Finland and Greece). Lithuanian stakeholders consider the **mentoring** as a process that contributes to the cultivation of a more inclusive green mindset and helps in the transfer of ideas from more experienced employees/professionals to raise competencies of younger ones. Another source of inspiration is the **participation of employees in conferences** that are being organized. If there is a lack of competence, some companies search for opportunities to participate in trainings or capacity building in order to cover the lack of knowledge or expertise. For another interviewee who is not so experienced with such initiatives it is believed that a part of soft skills education is included in various engagement processes, which are more present and visible while involving various communities, even schools, youth, adults and elderly, all kinds of stakeholders. Then not only the initiators are learning skills through the engagement process, but also the participants and interested parties who are learning how processes should take place, how to take the lead (leadership), how to co-create new sustainable solutions for their community, etc. The factor of engagement is linked also to the participation in various international projects where skills such as leadership, engagement, collaboration, co-creation are much-needed even though the examined topic is based on hard sciences.

When it comes to benefits of these skills for their sector and their environment at micro-level, Lithuanian stakeholders from green sectors strongly argued that both in public and private sector soft skills are becoming more and more relevant in any kind of field. The most important benefits that can be produced through the development of soft skills in green sectors are the following:

- ❖ **Soft skills help gain personal and mutual benefits.** This can consequently lead to a smoother and more productive working environment and enhances the common vision. If, for example, one's personal values align with a company's values this is unequivocally beneficial, though for that it is necessary to have a deeper understanding.
- ❖ Through soft skills sometimes the achieved results are of higher quality. Soft skills can help educate and convey information in a clear and easier way and to

move towards the result. It would help to persuade other people who may have a different belief or approach.

Poland:

Regarding current initiatives related to their company training strategy in soft skills, as already stressed in the Category 1 (*current needs and level of awareness*) most Polish interviewed stakeholders are not well-informed or aware of such practices. As pointed out by an interviewee from the civil engineering sector and energy building efficiency with 10 years of experience in his company *'I think the first reason for this is that people don't see the point of development and the importance of working on soft skills. The second reason is that people do not know that these skills can be shaped or learned. There is a perception that soft skills are strongly linked only to character traits and personality. They are trait acquired during childhood that cannot be changed or trained. I know that there are some training courses that aim to develop soft skills, but I am afraid that once they are completed, the effect is small and there is no additional benefit.'*



'In case of a future soft skills training in connection to green transition and sustainability in our company area, employees could develop a better understanding and empathy for pro-ecological activities which would influence their own actions and perception of environmental problems'.

Concerning the existence of initiatives and benefits of soft skills development, two paradigms were provided. The first case comes from a chairperson with more than 17 years of experience in the sector of agricultural production. Although this employer is not well-informed about such initiatives, especially those related to soft skills' connection with the green transformation, he mentioned a personal experience through his involvement in soft skills sessions, by training young people at university as an expert in business practices.

A second interviewee from a green energy company provided the example of student internships in his company as good initiative as also the application of some trainings showing the impact of energy on the environment or the analysis of the greenhouse effect, although with not particular attention to soft skills.

With regards to the benefits that green 'soft' skills can offer to their company and mostly to their staff's innovation and adaptability, Polish stakeholders focused on the following advantages:

- ❖ **Soft skills offer greater professional benefits, also financial** (better appearance = greater benefits), leading to a more efficient and effective company.
- ❖ **Soft skills offer greater motivation for career development.** Acquiring soft skills will allow employees to consciously engage in the topic of green transformation. For an employee, gaining soft skills is an opportunity for self-

development and a chance to build relationships in groups of different social groups.

❖ **Soft skills development contributes to a greater freedom of actions and way of thinking of resolving problems thanks to creativity and adaptability.**

Portugal:

Most Portuguese green company stakeholders are somehow informed for several current practices that enhance soft skills inside green companies, although most of them are not implemented in a systematic way. However, any identified practices focus mainly on trainings, something that was observed in all previous countries as common point. Indicatively, one interviewee in the sector of Environmental R&D (Research and Development) mentioned that leadership and communication trainings are practiced in their sector to develop employees' soft skills for the green transition. These initiatives aim to **cultivate critical thinking, a sustainable mindset**, and other virtues related to soft skills. A second interviewee reported about training initiatives with **collaboration workshops, communication training, change management training and leadership programmes** to develop employees' soft skills for the green transition. Regarding the benefits of soft skills for the green sector and for the development of employees, the stakeholders underlined the following ones:

❖ **Soft skills empower employees to drive innovation**, engage stakeholders, and implement sustainable practices.

❖ **Improved soft skills can lead to career advancement and open up new opportunities.** Better communication and collaboration skills enhance working relationships, creating a more positive work environment.

❖ **Soft skills development in green companies enhances the company's reputation and competitiveness** but also **positively it impacts the environment and society.** In addition, the acquisition of soft skills can lead to improved project outcomes and the workforce with stronger soft skills is typically more innovative, which is crucial for advancing technology and processes in some green sectors.

❖ **As individuals enhance their teamwork, communication, analytical abilities, and other soft skills, various workflows within the organization are likely to improve.** Once these advancements are in place, the organization can consider introducing the theme of green transition, positioning itself for long-term integration into sustainable initiatives and allowing for more seamless transitions to sustainable practices.

❖ **Strong soft skills enable better stakeholder relationships, effective engagement** with clients, investors, policymakers, and the public, building support for sustainability initiatives and enhancing the sector's image. Ethical decision-making is promoted through ethics training, avoiding potential harm by considering social and environmental implications.

- ❖ Soft skills such as adaptability and resilience skills equip the sector to **navigate uncertainties and rapid changes** associated with the green transition effectively.
- ❖ Soft skills can contribute to professional advancement, **opening up new prospects** for employees in the field. In combination with problem-solving skills this can lead to increased job satisfaction and recognition, while enhanced relationships built via communication and emotional intelligence can encourage a healthy work environment.

Summary of key findings of interviews with green businesses

Category 1: Current needs in green economy areas

- 1) Soft skills can influence the portfolio of green companies. They are important for all sectors, but it often depends on the nature and requirements of their work and position.
- 2) Connection with green transition: not much explored until now in most companies
- 3) All interviewees consider soft skills important. In case of Poland & Portugal they are not so familiar with practising such skills in their 'green' professional environment.



Category 1: Most needed soft skills for green economy sectors

Open-mindedness, flexibility, teamwork, empathy, ecological empathy (Poland & Portugal), collaboration, effective communication active listening, critical thinking, conflict resolution, negotiation skills, leadership, problem-solving, 'out of box' thinking, ability to prioritise tasks, creativity in applied solutions



Category 2: Limitations & gaps

- 1) difficulty to adjust the technical knowledge and skills into real world problems and needs
- 2) lack of taking risks or sharing knowledge
- 3) lack of an organized, top-to-bottom effort to develop soft skills
- 4) limited creativity and understanding of soft skills' importance
- 5) limited budget in organising capacity building trainings in soft skills



Category 3: How soft skills can benefit a green employee with STEM background?

Cultivation of a critical 'green' mindset, foster innovation in thinking, offer motivation in work, help convey information in a clear way, driver in new opportunities and in interpreting complex ideas more creatively, make employees more productive.



Category 3: Most usual type of initiatives from green companies

Trainings dedicated to specific skills (often in team building, communication, conflict management), peer mentoring, online courses, collaborative workshops, participation in conferences.

4.3 Step 3: Surveys with STEM professors and students¹⁰

Step 3 of research activities focuses on the development of two separate online surveys that were addressed to educational providers and students from STEM fields, as complementary activity to the conducted interviews. All partners contributed to the design and distribution of these surveys. The main goal of both questionnaires was to capture the perception and level of awareness of these stakeholders about the integration or development of soft skills in the context of green skills within STEM fields and technical curricula. Second, the surveys aimed at identifying and assessing current gaps and potential shortages on soft skills in STEM curricula but also possible pathways to enable the effective and long-term incorporation of soft skills in STEM higher education.



Note about the anonymity of data: all survey findings data that were collected and are analysed, as part of SOFTEN framework, serve only for the purposes of research and operate as useful feedback and insight from the side of targeted stakeholders whose opinion is expected to enrich further the investigated topics.

4.3.1 *Structure of surveys and common survey items*

Both surveys were developed online as Google form that is the most widespread type for online surveys. The size of surveys was typical, including 5 main parts and 23 questions in the students' survey and 4 main parts and 20 questions respectively in the educational providers' survey. Before the beginning of surveys, an introduction was provided to survey respondents – highlighting a summary of the project's goal, main objectives of survey and its outcomes, the estimated duration as also a short description of specific main terms (e.g., soft skills, green 'soft' skills, STEM, green transition) – to facilitate them to understand better the examined topic. Regarding the way both surveys were structured, the SOFTEN partnership agreed upon some common points for their creation and survey items. The common parts for both surveys refer to the following categories (Table 6).

TABLE 6. LIST OF COMMON QUESTIONS IN BOTH SURVEYS

- | |
|---|
| <ol style="list-style-type: none"> 1) Demographic information such as academic background (for students), educational level (for students), current position (for educational providers), country (for both), gender (for both). 2) Level of knowledge and awareness on soft skills and on soft 'green' skills in STEM fields and curricula 3) Perception about the importance of soft skills for STEM curricula and green transition 4) Identification of gaps and needs for integrating soft skills in green education in STEM curricula – in this category there was a separate question related to soft |
|---|

¹⁰ The image was retrieved from the following source: <https://form-publisher.com/blog/make-a-survey-in-google-forms/>

skills that STEM students prefer to further develop to adapt effectively to the green transition and green economy jobs. In students' survey, this question was included in the previous category (*Importance of soft skills for STEM curricula*).

5) **Aspirations and pathways to enable the embededness of soft skills in STEM curricula** – investigation on the types of educational tools/ training methods that targeted groups prefer for spurring the agents of STEM educational area to improve their green thinking and to embed soft skills in their technical field under an interdisciplinary and more holistic approach.

6) **Closing part**– questions related to the participants' interest to be informed about the SOFTEN activities.

4.3.2 Data analysis from both surveys

Before proceeding with the analysis of collected data based on the above presented topics, an overview of collected responses in comparison to the initial target in each country is presented in Table 7.

TABLE 7.INITIAL TARGET NUMBERS AND COLLECTED RESPONSES

Target group	Educational providers	STEM students
Initial total targeted number for 6 participating countries	60	60
Achieved total number of collected responses	65	98

Survey for STEM students

Part 1: Demographic data

To begin with the demographic data, regarding the collection of responses per country, most responses come from STEM students in Poland, as almost 43% of the total number of responses participated in the survey, according to the Figure 5:

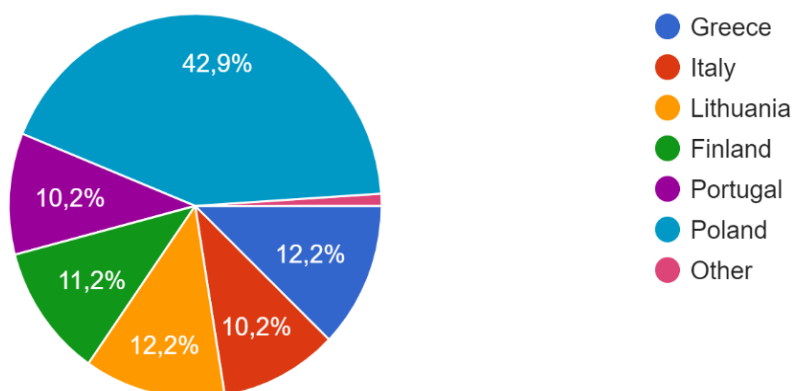


FIGURE 5.ALLOCATION OF COLLECTED RESPONSES PER COUNTRY

Most respondents from the group of STEM students come from Poland, reaching almost 43% of responses, a discrepancy that may be attributed to the fact that Polish students were more available and inclined to talk about soft skills. Another reason may be that, with the exemption of Italy, Poland is demographically bigger than the other participating countries, thus enabling stronger sampling. In the remaining countries (Greece, Italy, Lithuania, Finland, Portugal) the percentage of responses is roughly the same, while a new element in this demographic question is that there was an additional option titled as ‘*Other*’ in the selection of country. This was added to give the opportunity to students from other European countries to share their opinion, current state of play or new experiences around the examined topic in the region they live and study. Regarding the gender allocation of the collected responses, around 51% of total number (50 out of 98) of respondents were female, followed by almost 46% (45 out of 98 in total) who were stated as male. When it comes to their level of education, the vast majority of respondents (approximately 61%) are bachelor’s degree students at the university they study in comparison with 28% of respondents who study in a master’s degree programme, as Figure 6 displays:

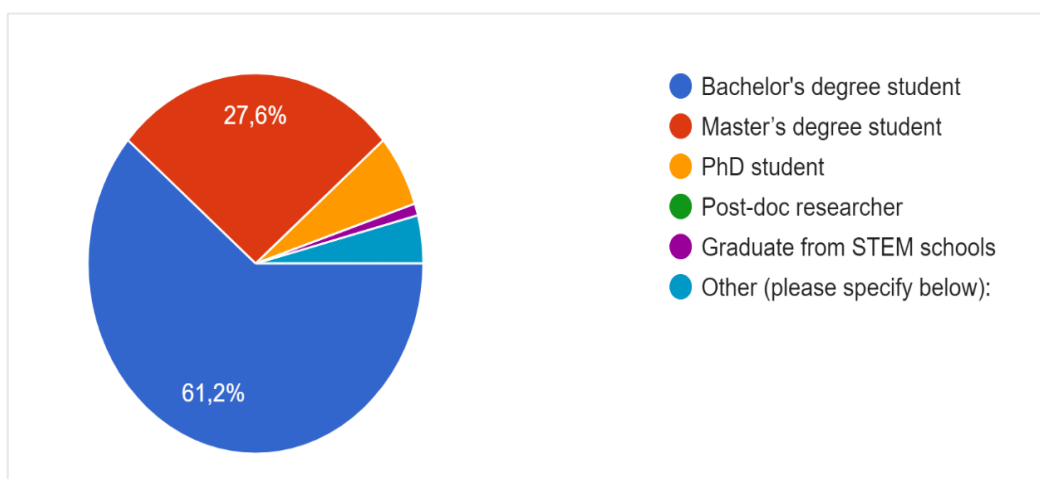


FIGURE 6. EDUCATION LEVEL OF PARTICIPATING STUDENTS

In relation to their academic background, there is a variety of fields that were mentioned, with the most predominant being the **engineering studies** (e.g., civic, electrical & computer engineering, environmental, chemical, nuclear, energy engineering, mechanical, agricultural, electrotechnical engineering etc.) from all countries. Other STEM fields of study that were mentioned by responding students include studies of economics & business, natural sciences, applied chemistry, waste management, agronomy, computer science, informatics, mathematics. In addition, approximately 94% of students study in a public university.

Part 2: Level of knowledge on soft skills

The analysis on the following questions of Part 2 regard the level of students’ familiarisation with soft skills and soft ‘green’ skills as well as their current

experience from their study programmes. To begin with, concerning their level of knowledge on soft skills, around 42% of students expressed that (approximately 41 out of 98 total respondents) they are familiar with this type of transferable skills (Figure 7).

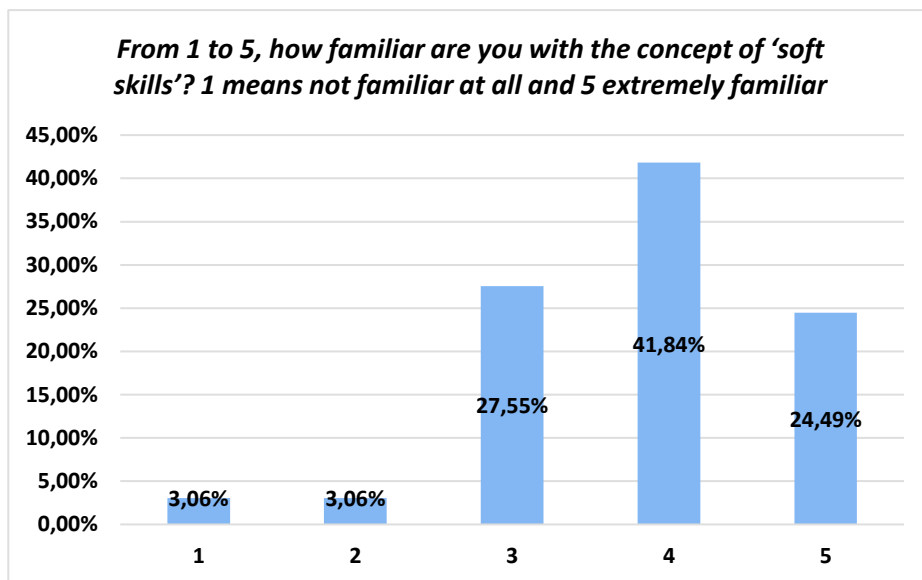


FIGURE 7.LEVEL OF STUDENTS KNOWLEDGE ON SOFT SKILLS

However, in the same question but with focus on soft 'green' skills, most students (about 32%) were stated as moderately familiar, according to Figure 8.

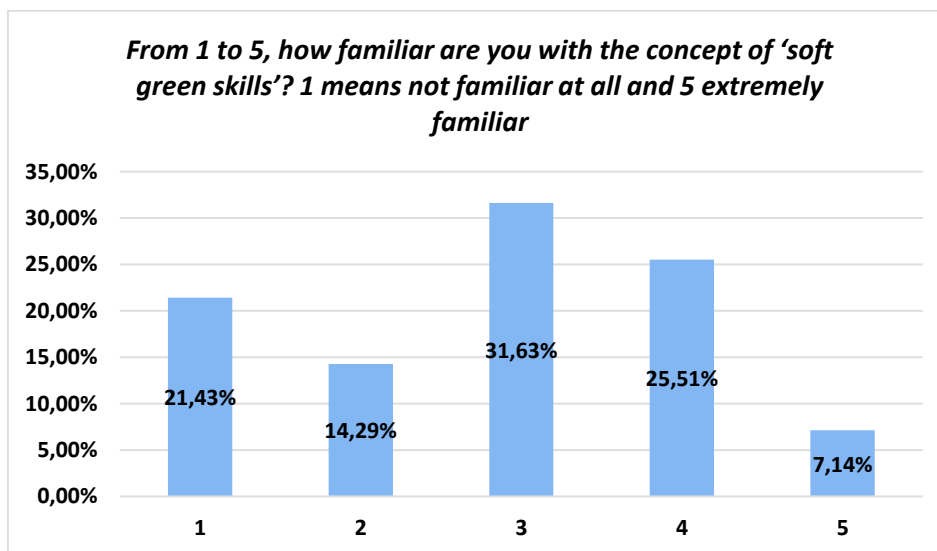


FIGURE 8.LEVEL OF STUDENTS KNOWLEDGE ON GREEN 'SOFT' SKILLS

This trend is confirmed by the following question which focuses on student's own estimation about their soft skills' development (as STEM learners). More specifically, almost 46% of total number of responses (45 out of 98 total respondents) indicated a medium-skill level (neither a poor level nor a very high), as displayed in Figure 9:

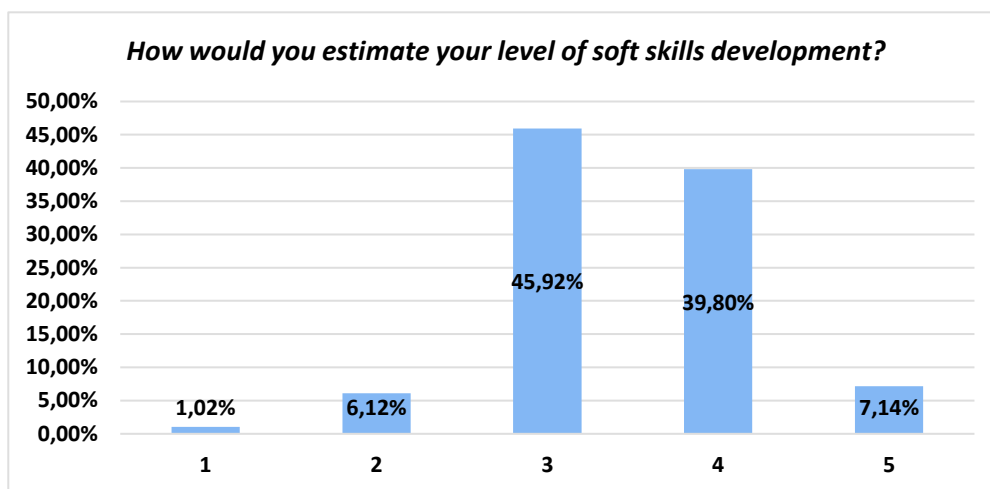


FIGURE 9.LEVEL OF STUDENTS ESTIMATION ON THEIR SOFT SKILLS DEVELOPMENT

Next, in the questions related to the current state of play in soft skills' trainings in their study programmes, almost 50 % of students (48 out of 98 respondents) seem not to be aware of the offering of opportunities for such skills-related trainings in their learning area (Figure 10).

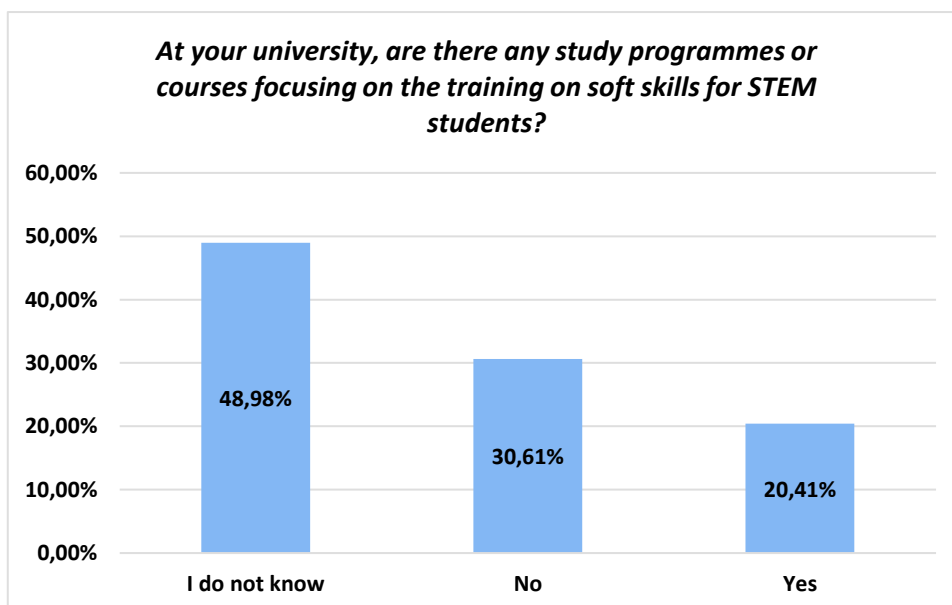


FIGURE 10.LEVEL OF STEM STUDENTS' AWARENESS FOR SOFT SKILLS TRAININGS IN THEIR STUDIES

The same shortage is verified also from the follow-up question that focuses on students' opinion about how much they are supported to develop soft skills, as part of their technical curricula. In particular, it is clear that most participating students from STEM studies have not received support from academic staff nor they have been involved by an educator in activities that can help them improve and leverage more productively such skills (Figure 11).

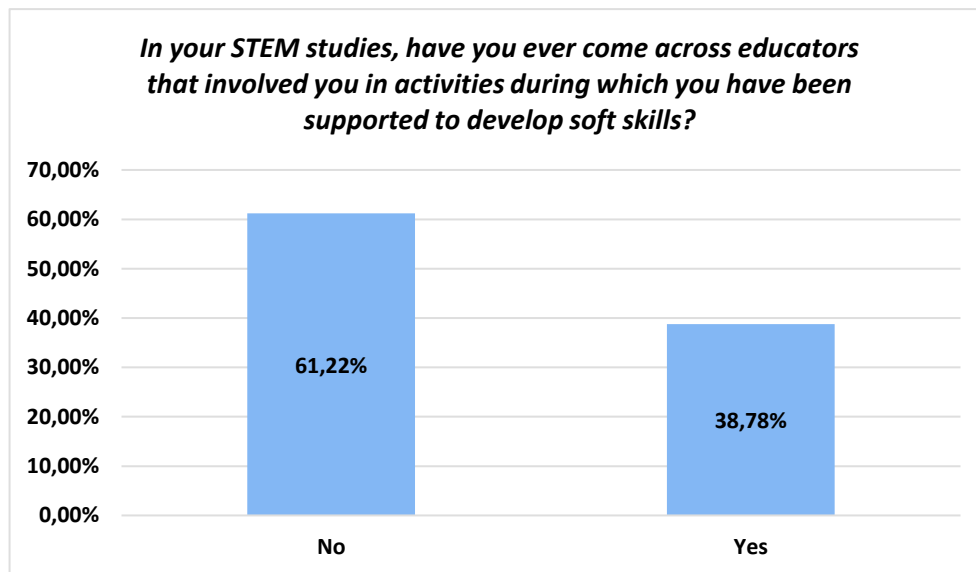


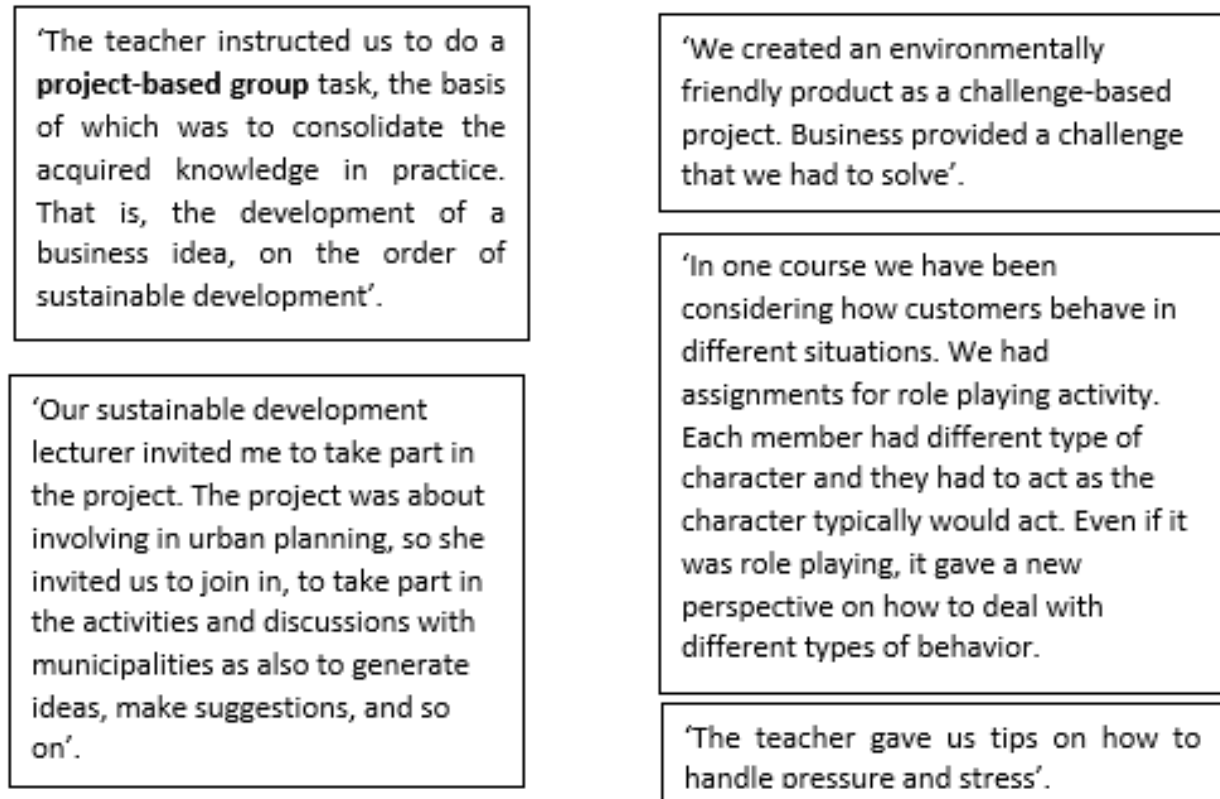
FIGURE 11. STUDENTS SUPPORT FOR SOFT SKILLS DEVELOPMENT

Regarding students who answered positively towards the existence of study programmes that pay attention to and focus, to some extent, on soft skills' development, some indicative paradigms that were mentioned by those STEM learners are listed:

- participation at seminars related to innovation,
- attending courses about ethics in many fields of research and other soft skills oriented towards their academic career and CV preparation,
- interpersonal communication course, initial programme for students' integration with some introduction to soft skills,
- special classes which were preparing students to final exam and future presentation at conferences,
- participation in volunteering student-led organisations and events with focus on soft skills training.

In addition, the following examples (Image 2) showcase the sporadic but real interest of some educators, as reported by a part of STEM students, to teach soft and transversal skills through participatory and interactive methods.

IMAGE 2. EXAMPLES OF STUDENTS-EDUCATORS COOPERATION



Part 3: Perception about the importance of soft skills for STEM curricula and green transition

This part of survey is dedicated to **students' opinion** about the importance of soft skills on green transition, green skills' development and green economy sectors. The following findings indicate that STEM students consider soft skills as valuable competencies for the improvement of their environmental awareness and the enhancement of their green skills. The first question that proves this finding is illustrated in Figure 12, where students were asked to state how much they agree with the opinion that soft skills can upgrade and boost their green skills, both as individuals and as scientists. Here, around 35% of total number of students expressed their agreement with this statement.

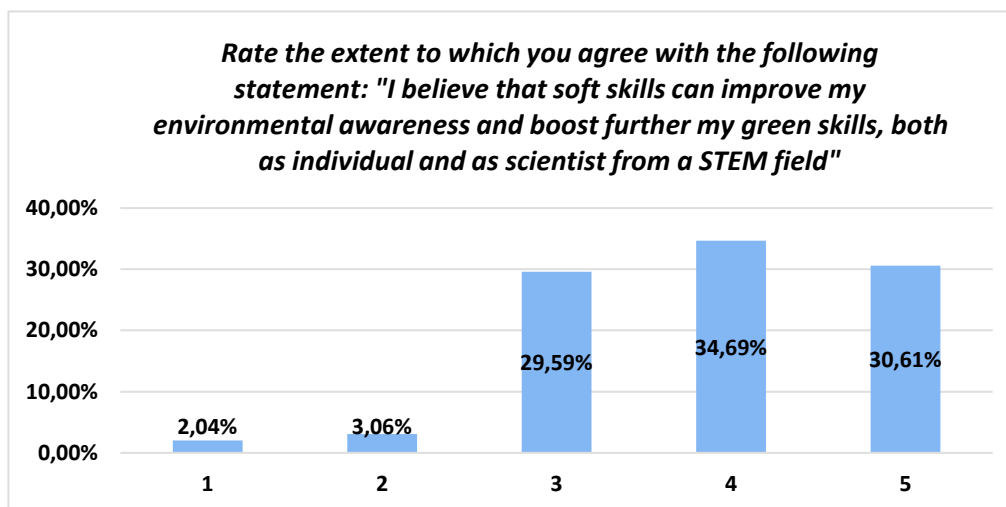


FIGURE 12. STUDENTS' OPINION FOR THE ROLE OF SOFT SKILLS ON ENVIRONMENTAL AWARENESS

Next, one of the most critical questions in both surveys regard the type of soft skills that were considered as the most important ones both from students and from educational providers in order that the former group advance their future professional development in green economy sectors and broaden their green skills.

From the one hand, regarding students' perception, they put emphasis on the following skills in relation to a potential, future 'green' career:

- 1st most important soft skill: **Communication skills**, reaching 55% (54 out of 98 respondents) of responses on students' preference.
- 2nd most important soft skill: **Problem solving**, reaching 47% of responses on students' preference (46 out of 98 respondents)
- 3rd most important soft skill: **Creativity**, reaching almost 45% of responses on students' preference (44 out of 98 respondents)
- 4th most important skill: **Planning & organizational skills**, reaching around 43% of responses on students' preference (42 out of 98 respondents)
- 5th most important soft skill: **Team management**, reaching about 36% of responses on students' preference (35 out of 98 respondents)

Other types of soft skills that are considered important but their percentage on students' opinion was lower than 35% are the following ones: i) between 30-35%: critical thinking, negotiation skills, leadership, analytical thinking, decision-making, ii) 20-30%: active listening, teamwork spirit and cooperation, empathy, networking, goal orientation, self-management (Figure 13).

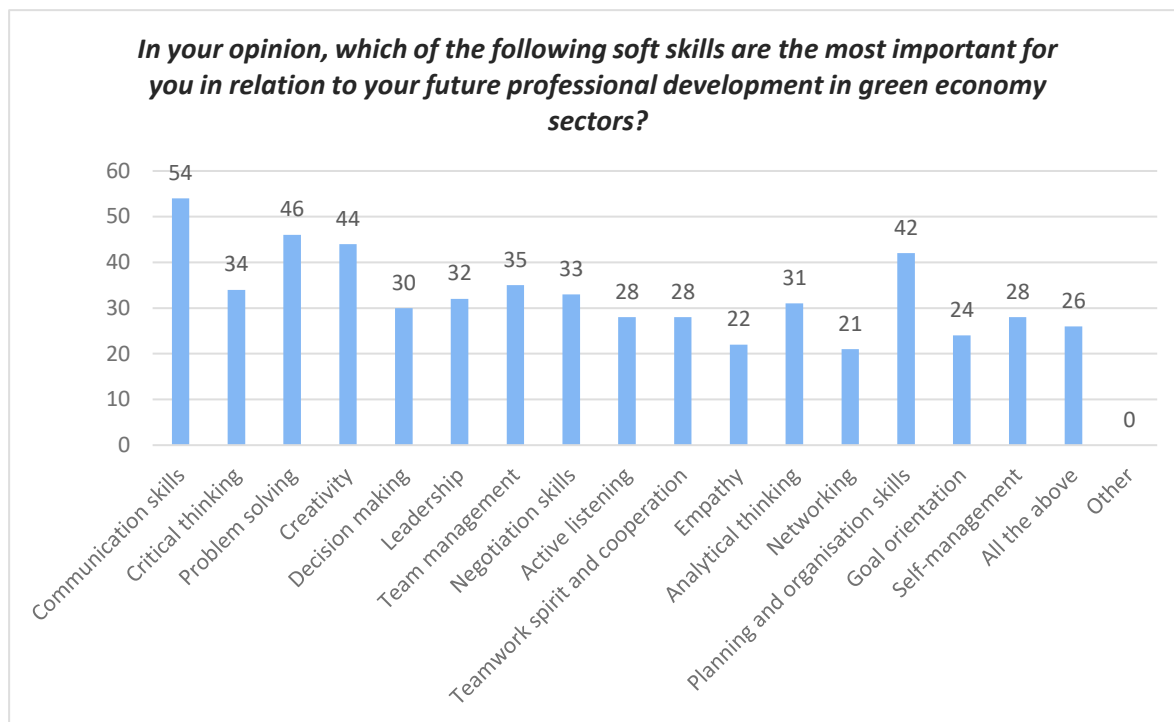


FIGURE 13. MOST IMPORTANT SOFT SKILLS FOR GREEN ECONOMY (STUDENTS SURVEY)

On the other hand, for STEM educational providers **critical thinking** seems to be the 1st option of their preference in terms of its importance, accounting for 82% (53 out of 65 respondents in total) as illustrated in Figure 14. For some other types of displayed soft skills in this question, some common points with students' preference were observed also in educational providers' survey. More specifically, the soft skills that in both groups are rated commonly by both groups in the top five list are the following ones (Figure 14):

- **Problem-solving:** is the 2nd most important skill for academic staff (like in the students' survey). The percentage in the educational providers survey reaches, in comparison to that of students, 62% of responses (40 out of 65 participants from academic staff).
- **Communication skills:** while in the students' survey they are the 1st most essential skill, for educators/ trainers it is the 3rd most important soft skill, with its percentage accounting for 59% (38 out of 65 participants)
- **Creativity:** in the educational providers' survey this skill was rated as the 4th most important (reaching 57%, that is to say 38 out of 65 respondents) competence.

Other soft skills that top very high are teamwork and cooperation (reaching 55% - 36 out of 65 respondents) as well as empathy for the environment (accounting for almost 48% - almost half of respondents), while the percentages for negotiation

skills and conflict management range from 35 to 45% (accounting for 43% - 28 out of 65 respondents and 39% - 25 out of 65 respondents respectively).

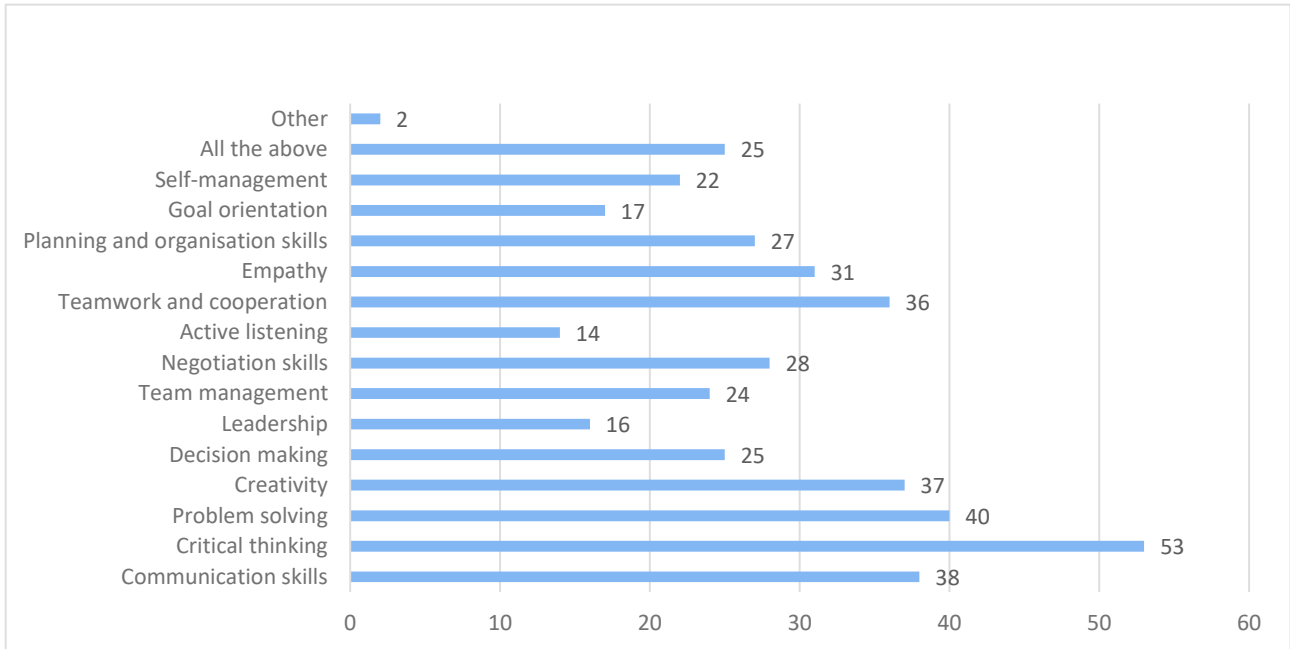


FIGURE 14.OPINION OF ACADEMIC STAFF FOR MOST IMPORTANT SOFT SKILLS FOR GREEN ECONOMY

Part 4: Gaps and challenges for integrating soft skills in green education in STEM curricula

This part of students' survey aims to investigate their opinion for any barriers and challenges that hinder the integration of soft skills in STEM courses, especially those with green orientation. In addition, students are given the opportunity to express their opinion for possible ways through which current shortages can be better addressed by their university or institution. To begin with, in the question regarding the challenge or gaps impeding soft skill' embededness in STEM courses an uncertainty was observed from most students (around 53% as displayed in Figure 15).

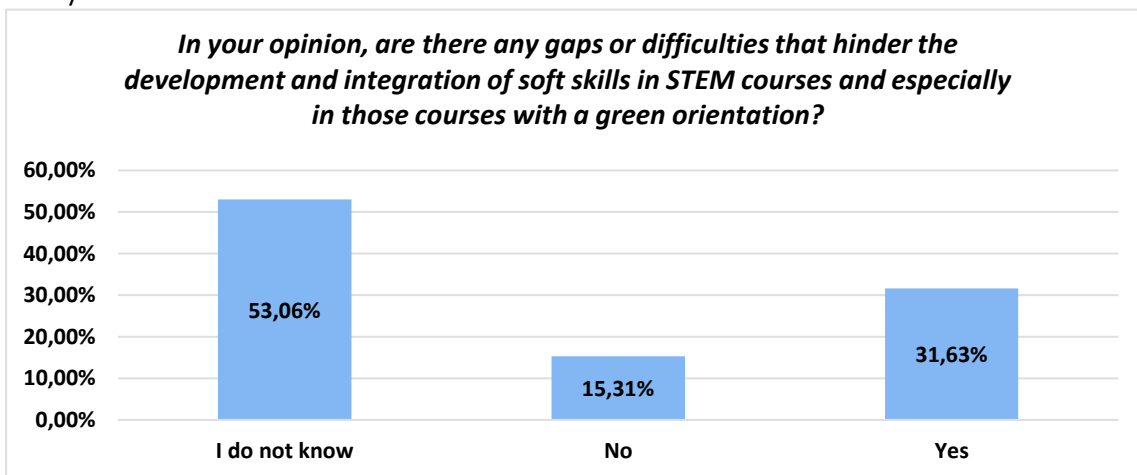


FIGURE 15. BARRIERS ON SOFT SKILLS DEVELOPMENT IN STEM COURSES (STUDENTS OPINION)

A part of students offered specific examples for the previous question. An indicative set of barriers mentioned by students is listed below:

- Lack of interest or willingness from educators
- Lack of engagement from peers or maybe lack of understanding for the benefits that soft skills can offer them in the long-term in the future work environment
- Much focus on 'hard' topics to cover and lack of a soft-skills supportive curriculum,
- Old fashioned way of teaching and old mindset from educators
- Outdated assessment processes
- Lack of interdisciplinarity in STEM fields
- Lack of training opportunities (within the curricula)
- General lack of knowledge about soft skills - no publicly available information about soft skills courses
- Lack of time from students to invest more, even through extracurricular courses, in soft skills' development.

Apart the difficulty and existing institutional gaps to integrate soft skills STEM courses, STEM students expressed their opinion about possible pathways by which the reported barriers could be overcome (Figure 16). The option that seems to gather the highest level of preference in students is the **combination of both theoretical training and hands-on activities on soft skills**, selected as the 1st option by 63 (out of 98) students (around 64%). Other suggestions that gained their interest are the **cooperation between academia and green companies**, with the active engagement of students, accounting for 59% (58 out of 98 participants) and next the **collaboration of educators with students** (reaching almost the same percentage) to **co-organise and co-create extra-curricular activities** dedicated to soft skills and their relation to green skills through real-life examples or case studies.

In which of the following ways could current difficulties or challenges be better addressed by the university or institution you have studied in order to enable more effectively the long-term integration of soft 'green' skills in STEM education?

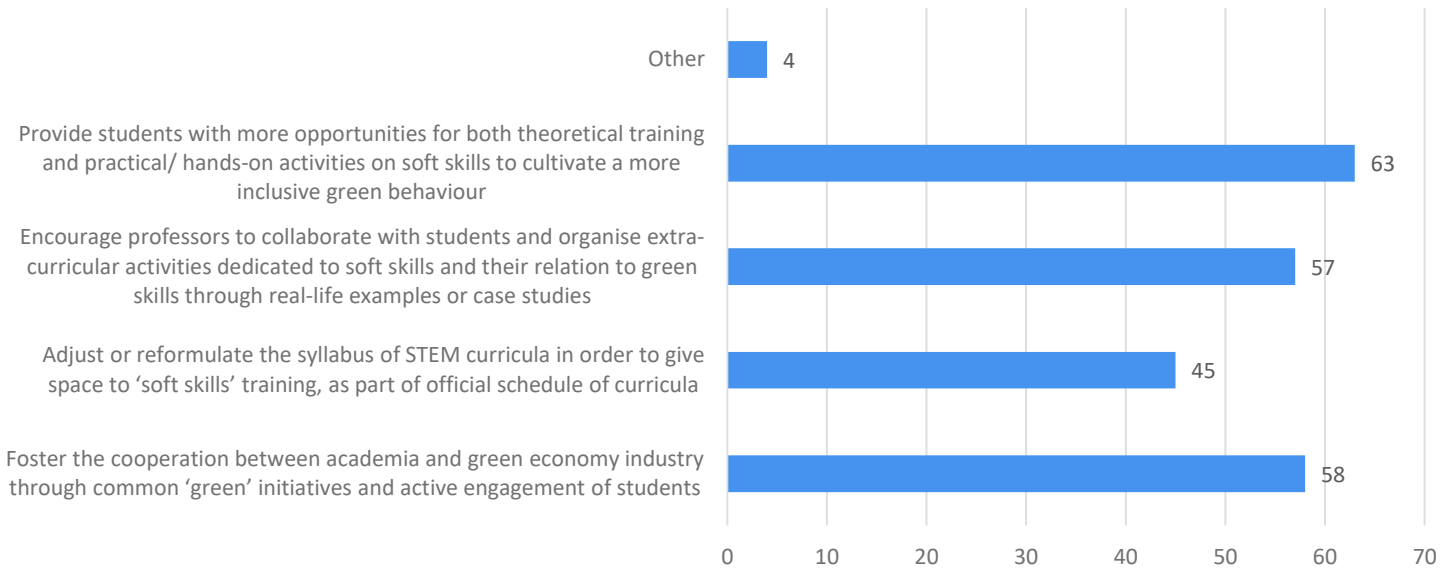


FIGURE 16. STUDENTS PREFERENCE FOR SOFT SKILLS INTEGRATION IN STEM EDUCATION

Part 5: Aspirations for the improvement of soft green skills and future career in green economy sectors

The last part of students' survey highlights their level of interest in developing further soft skills in the context of green thinking through university curricula and the extent of their agreement or disagreement in a list of channels/methods based on which they prefer to learn more and cultivate soft 'green' skills. Regarding the first question, Figure 17 showcases that there were positive responses in terms of their interest to further enhance their soft 'green' skills in the context of their curricula reached, as aggregate, around 75 % of total number of STEM students (4: agree with almost 37 % and 5: strongly agree with almost 35%).

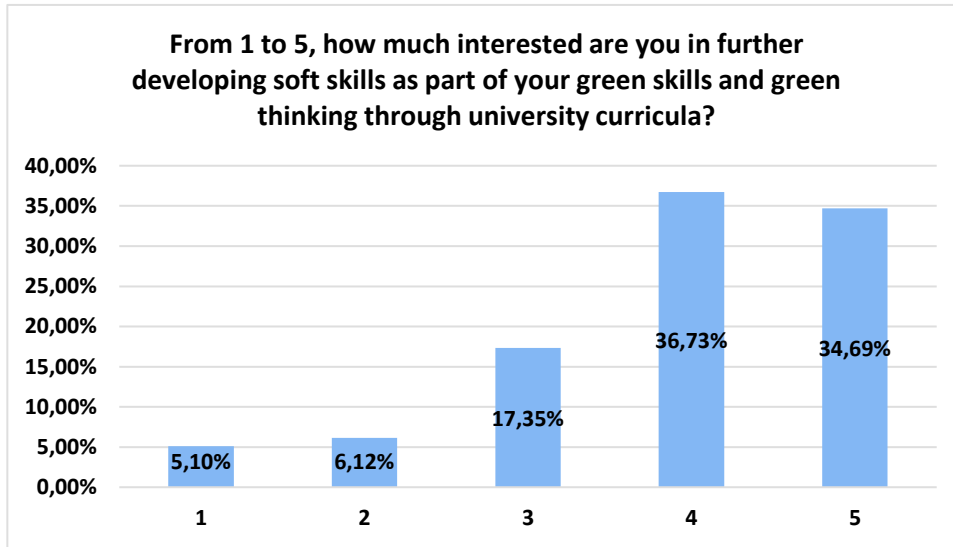


FIGURE 17.LEVEL OF STUDENTS INTEREST ON SOFT SKILLS

The last question regards the ways that STEM students liked most for developing soft skills in the context of green skills. The predominant method in students' preference is related to practical workshops (more than 50 % of total respondents). The next methods that top high are: Youtube channel with dedicated material, with 35% (Figure 18). Other practical ways regard online courses or development of e-learning platform dedicated to soft skills, reaching almost 28%.

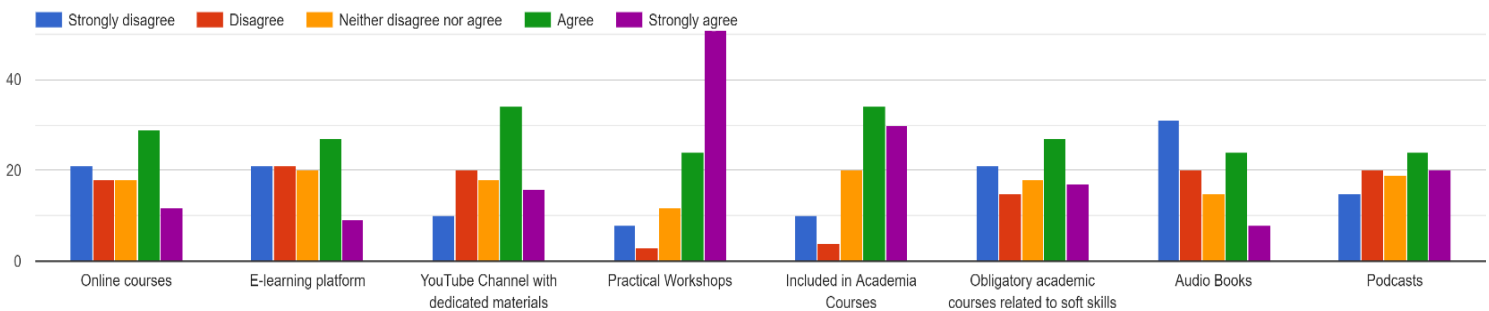


FIGURE 18.WAYS THROUGH WHICH STUDENTS PREFER TO DEVELOP GREEN 'SOFT' SKILLS

Finally with regards to the benefit(s) they can gain through the acquisition of soft skills, as part of their green competences and their adaptation to green economy jobs, STEM students mentioned the following ones:

- Soft skills offer valuable communication channels with other people and this can give a competitive advantage to them in green jobs.
- Students can stand their ground better in a work environment and they can make a better self-evaluation and realize their role within any working environment.

- Interpersonal skills (e.g., collaboration, innovation, leadership, stakeholder engagement, and ethical considerations) enable STEM professionals to make a significant positive impact in the transition towards a sustainable future.
- STEM graduates can be motivated through soft skills to make a broader impact and support the transition towards a more sustainable future.
- Support students to be more conscious to environmental hazards and more open to new green ideas.
- Soft skills may enable STEM graduates to effectively communicate complex technical concepts to non-technical stakeholders, fostering better collaboration in green economy jobs.
- By combining technical expertise with critical thinking and creativity, STEM graduates can contribute to sustainable innovation and decision-making processes.

Survey for educational providers

Part 1: Demographic data

For the survey addressed to educational providers 65 responses were collected in total, with both associate professors and lecturers representing (as separate groups) 21,5 % of responses (Figure 19) and almost 57% of total number being male respondents (37 out of 65 participants). Next, 20% of total responses came from professors, approximately 19% from assistant professors and almost 17% from PhD researchers.

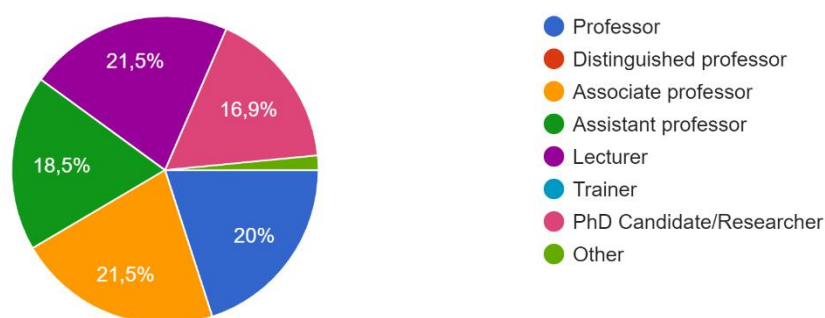


FIGURE 19. TOTAL SAMPLE DIVIDED PER POSITION OF RESPONDENTS

Regarding the type of university and the years of their teaching experience, almost 94% of respondents (61 out of 60 respondents) teach in a public university and their experience ranges from 2 years to 30 years of teaching. In terms of their area of expertise, there is a variety of STEM fields such as engineering (environmental, mechanical, software, electrical, etc.), mathematics, applied bioeconomy, physics, chemistry.

Part 2: Level of awareness on soft skills in STEM curricula

The collected findings for the level of awareness of STEM educational providers for soft skills, their connection to green skills and their integration in STEM curricula

present an interesting variety in observed trends and perceptions and verify to some extent what has already been identified through the previous research activities (e.g., interviews). More specifically, in the question related to the level of familiarity with the concept of soft skills, around **55% of respondents** (36 out of 65 respondents) stated that they are familiar with these skills (mainly their meaning or as general concept), as Figure 20 displays:

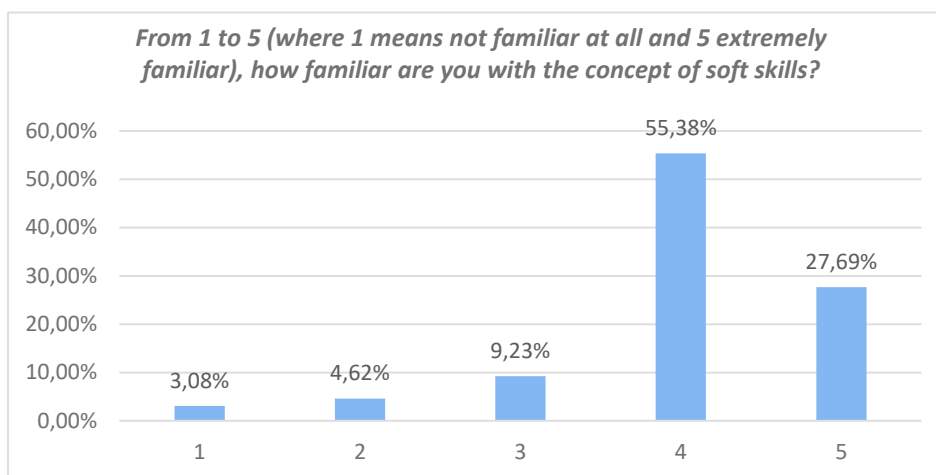


FIGURE 20.LEVEL OF FAMILIARITY OF EDUCATORS ON SOFT SKILLS

When it comes to their level of knowledge and awareness on soft green skills, again a positive trend is observed as almost **34% of responses** confirmed an existing familiarity from their side with the connection of soft skills with green skills, as illustrated in Figure 21:

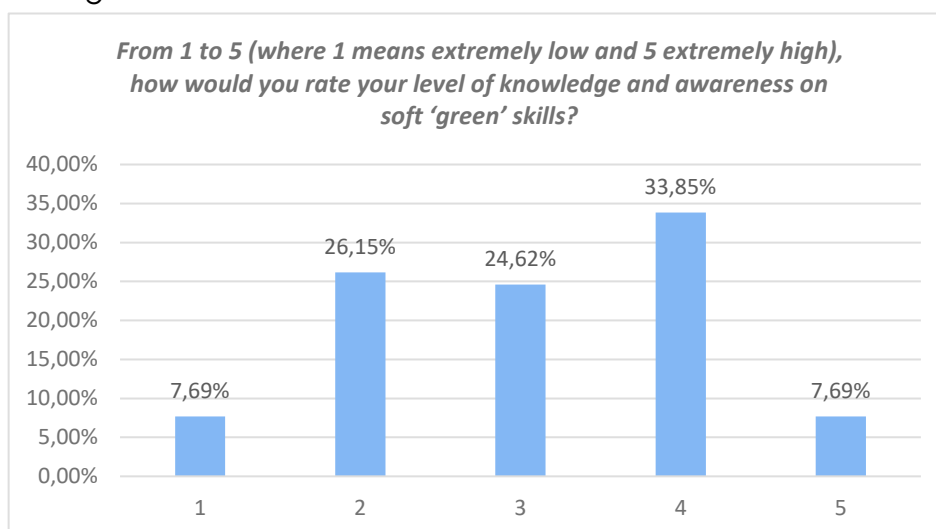


FIGURE 21.LEVEL OF FAMILIARITY OF EDUCATORS ON GREEN 'SOFT' SKILLS

However, it is also worth mentioning that around **26%** of total respondents seem not to be so familiar with the fact that soft skills are part of green competences. Regarding their opinion about their students' awareness for soft skills and their

relationship with green competences and green transition, about 46% of total respondents answered that students are aware of this relation, according to Figure 22:

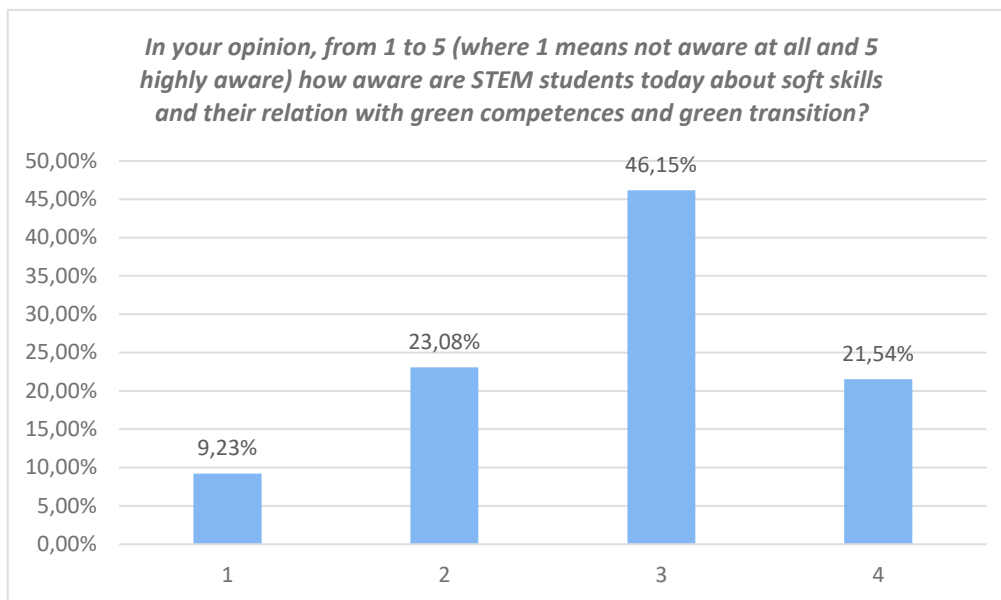


FIGURE 22.OPINION OF ACADEMIC STAFF FOR STUDENTS' AWARENESS ON GREEN 'SOFT' SKILLS

Another interesting finding is related to the level of integration of soft skills in STEM curricula. Almost 37 % of participating educational providers indicated a moderate level of these skills' development within STEM study programmes (Figure 23), verifying that there is still space for improvement in this process.

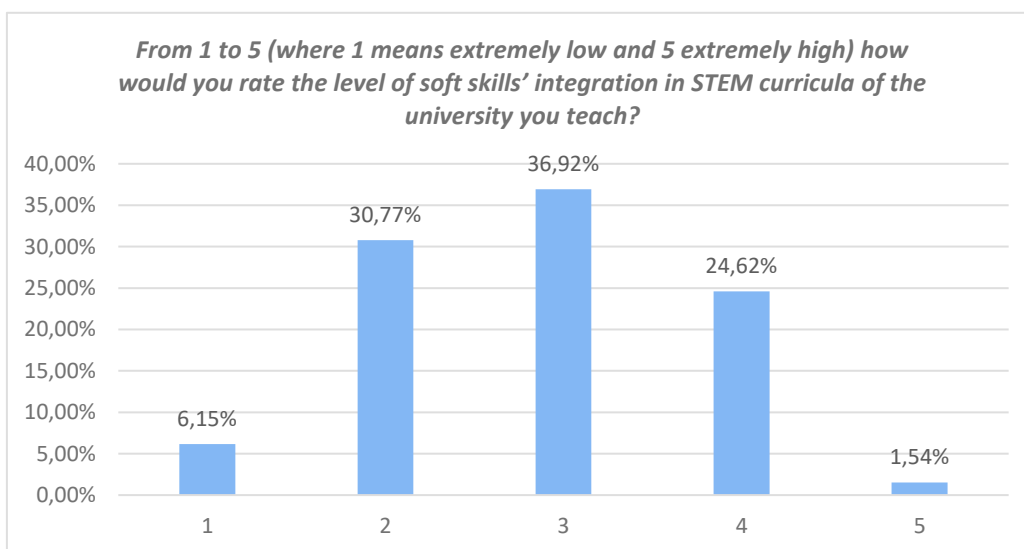


FIGURE 23.OPINION OF EDUCATORS FOR SOFT SKILLS INTEGRATION IN STEM CURRICULA

Part 3: Examining the perception on the importance of soft skills in STEM ‘green’ academic studies

Regarding their perception of the importance of soft skills for STEM students’ career in green economy areas, most participants expressed their interest and agreement, with high percentages. In particular, **40%** of total participants (26 out of 65 respondents) consider soft skills important and almost **37%** as very important (Figure 24):

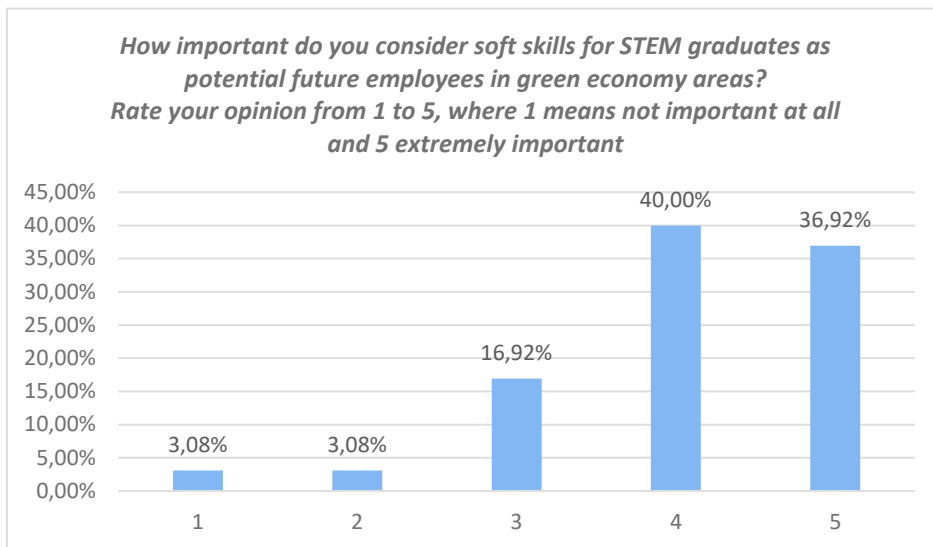


FIGURE 24.SOFT SKILLS IMPORTANCE FOR STUDENTS' GREEN CAREER(EDUCATORS' OPINION)

Regarding the level of their interest to incorporate soft skills in their courses, it is impressive that around **83%** of total respondents show clearly their high level of intention to integrate soft skills, according to Figure 25:

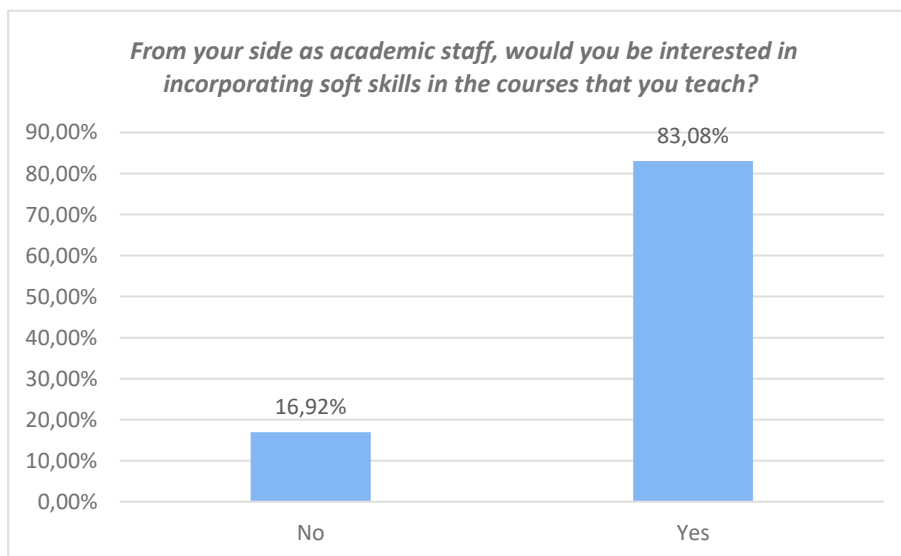


FIGURE 25.LEVEL OF EDUCATORS INTEREST FOR SOFT SKILLS INCORPORATION IN THEIR COURSES

An additional but critical question for this of survey regards the ways – opportunities through which according to participants’ opinion, it can be more effective to achieve the embeddedness of soft skills development in STEM curricula in your university. Specifically, Figure 26 shows that 42 out of 65 respondents (about 75%) prefer to contribute to this effort by incorporating soft skills as part of official curriculum, despite the existing difficulties to achieve this in all countries or within their academic field. The next most preferred suggestion is to embed soft skills as part of lifelong-learning trainings for students in order to be aware of existing good initiatives and gain hands-on experience.

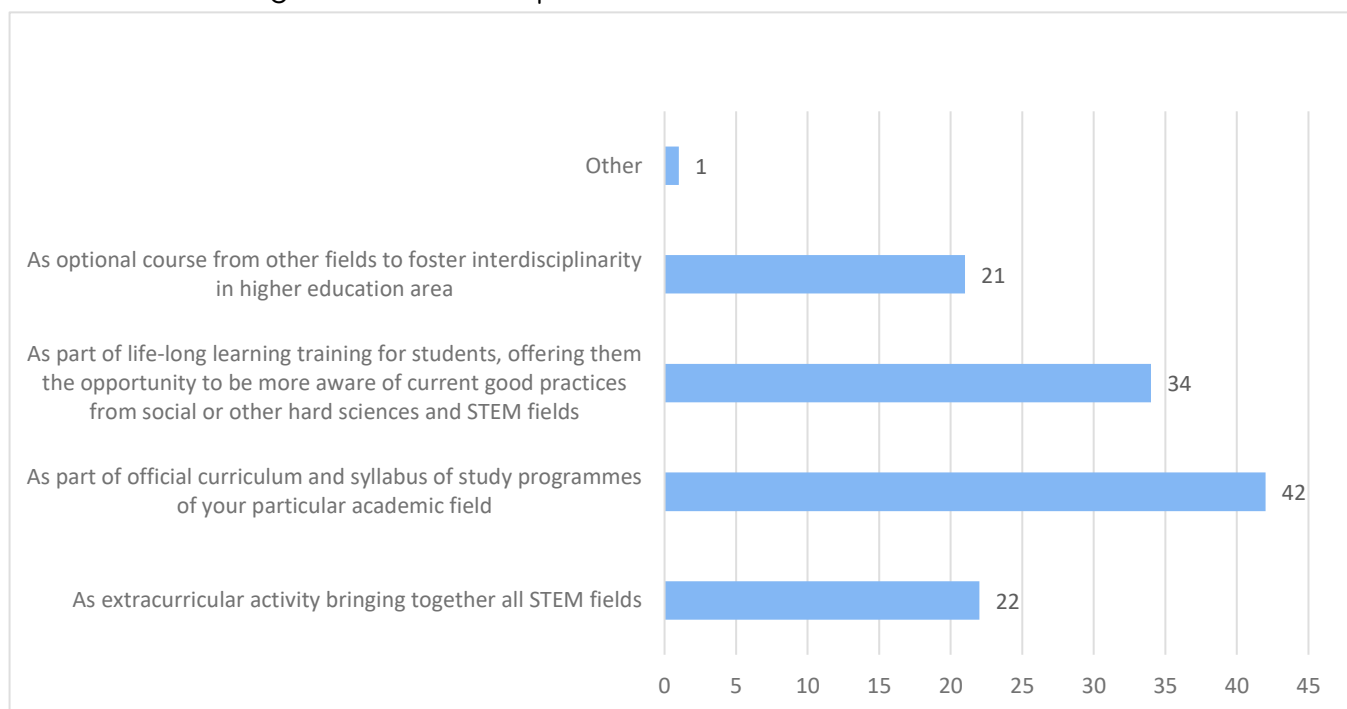


FIGURE 26. WAYS TO EMBED SOFT SKILLS IN STEM CURRICULA - EDUCATORS PREFERENCE

Part 4: Identified gaps and needs on soft skills’ development in STEM green curricula

The last part focuses on current gaps and barriers that educational providers mentioned about soft skills’ development in STEM curricula as also on tools and educational methods that they can deploy as academic staff to improve and boost these in STEM education – from the side of their own field – for spurring the green thinking in a different and more holistic way. Regarding the identified gaps, the most important ones that were reported are listed below:

- ❖ low level of awareness for good initiatives in this topic
- ❖ poor understanding of these skills’ demand by today’s green industries.
- ❖ **lack of interest** from the side of educators in teaching about soft skills

- ❖ soft skills are **not formally recognised and valued** at the higher educational level, and this often prevents other colleagues or students to fully understand the uniqueness of soft skills, let alone their connection to the green transition.
- ❖ lack of motivation or real interest from several colleagues to promote **interdisciplinarity** and soft skills or to teach a hard skill in a more creative way, especially in a part of technical courses around sustainability.
- ❖ Many technical courses still follow traditional educational styles; **low propensity for multidisciplinary and holistic approaches** to problem solving and problem setting.

When it comes to educational tools that can play a catalysing role in incorporating more effectively soft skills in STEM courses, almost **59%** of educational providers (38 out of 65 total respondents) are in favor of the application of **interactive learning methods** (such as role-playing, brainstorming, case-studies) to teach and cultivate on the ground soft skills (Figure 27). The same high percentage is also observed in the suggestion of implementation of projects focused on environmental problems in combination with group activities that can promote many soft skills (communication, problem solving, exchange of ideas and critical thinking, innovative ideas, etc.). Other methods on which this target group seems to put special emphasis are the application of hands-on interdisciplinary activities with a variety of tools (from workshops to educational games and field trips), attracting the interest of 33 out of 65 total participants (almost 51% of responses), followed by the application of collaborative methods (e.g., design thinking or service-learning).

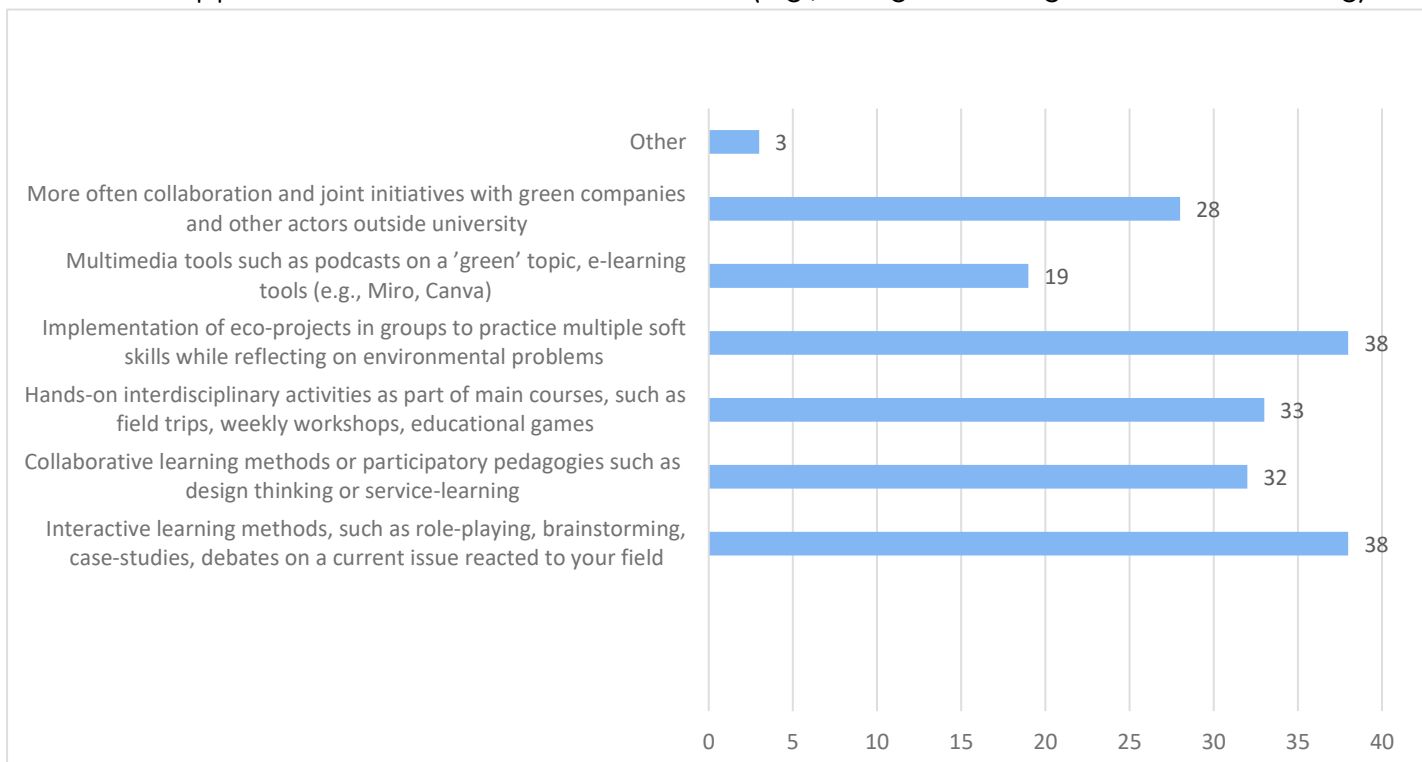


FIGURE 27. EDUCATIONAL METHODS TO IMPROVE SOFT SKILLS IN STEM EDUCATION AND GREEN THINKING

4.4 Step 4: Focus groups – reflection on research results¹¹

4.4.1 Objectives, themes and target groups

The last activity that concludes the research study of SOFTEN project under WP2 regards the implementation of one focus group in each country between mid-September and mid-October 2023, upon the completion of three previous main activities (desk research, interviews & surveys) and the primary analysis of all collected findings. Most focus groups took place online, with the duration varying in each country, ranging from 90 to 120 minutes in total. The conducted national focus groups were a complementary activity and served as a reflective discussion and its main goal was to present to a group of different stakeholders the project and a part of key research findings. The target groups of this activity included: academic staff and researchers from various STEM fields, stakeholders from Vocational & Education Training (VET) or life-long learning centers, career development and active learning experts and green economy representatives.

Before the focus group, all partners were provided with a detailed guide including all necessary steps (description of the activity, target groups, duration) and a reporting template was also developed to facilitate each partner to summarise the key points of the focus group discussion. In order to have a consistency in the discussed topics, all partners followed during the focus group a series of pre-selected thematic areas with three main categories of questions (Figure 28).

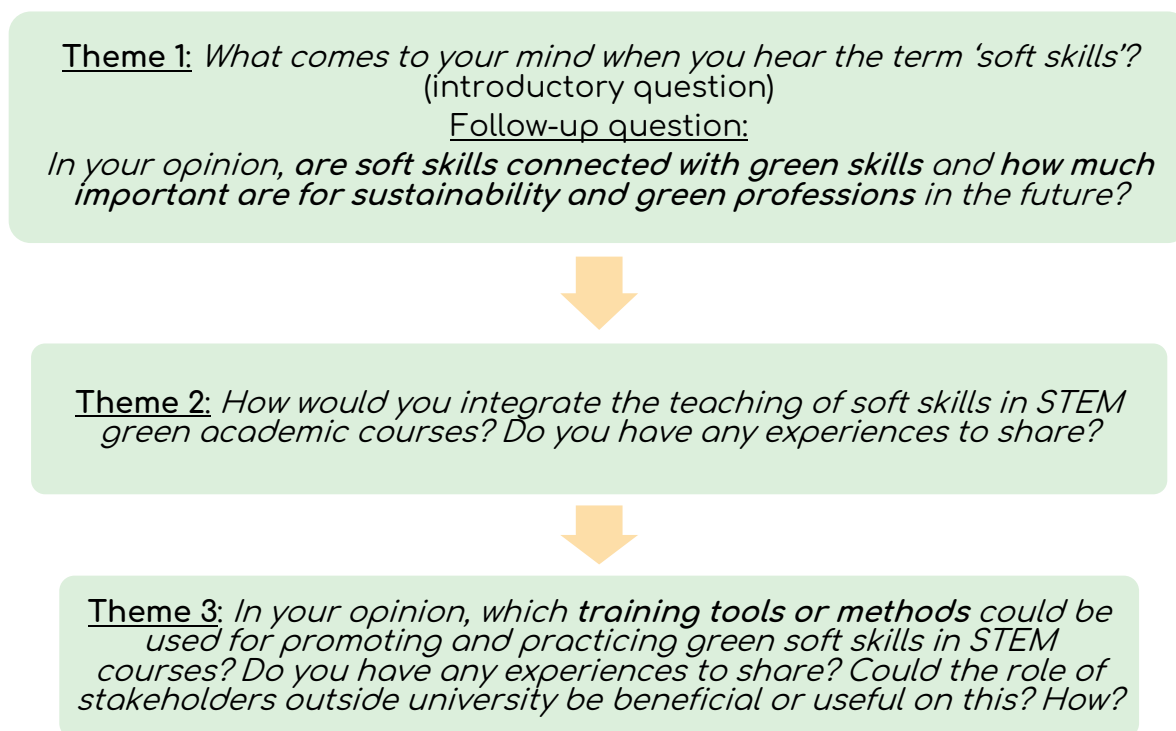


FIGURE 28. FOCUS GROUPS THEMES

¹¹ The source of image is available here: <https://www.vogovoice.com/blog/focus-group-a-tool-for-productive-market-research/>

4.4.2 Focus groups results

This sub-chapter focuses on the collected opinions and ideas that participants expressed in all national focus groups. The general outcome from all focus groups shows a satisfaction of participants as the majority of them found interesting the examined topics and the way the results are analysed in the framework. More details on the shared ideas are grouped and emphasised under each discussed thematic area.

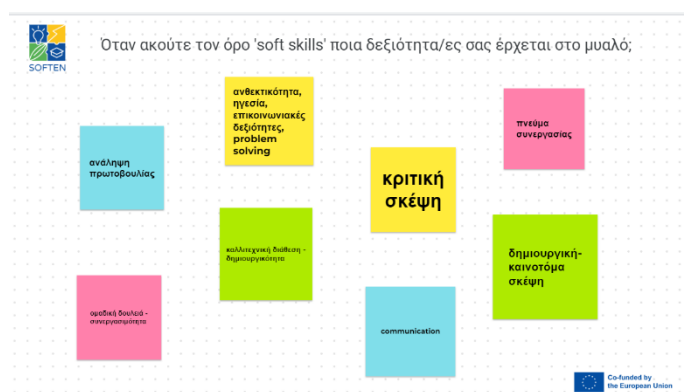


Theme 1: Familiarisation with soft skills & importance for green professions

Each partner started their focus groups by providing an overview of the project. Next, a warm-up question was posed to participants in relation to whether and how much familiar they are with the concept of soft skills. In some countries, partners applied creative online presentation tools such as Wooclap¹² (in case of Italy and Portugal) or Jamboard (in case of Greece) to let attendees express visually their own thoughts.



Presentation of most desirable green 'soft' skills (Italian focus group)



Most popular soft skills for Greek participants

¹² Wooclap webpage: <https://www.wooclap.com/>

Most participants confirmed their general awareness with soft skills, except for Finnish participants where the majority were not so much familiar with this term. However, the same group of participants mentioned similar terms with soft skills (e.g., 'generic skills', 'cooperation skills', 'basic skills') they are familiar with. Regarding the question focused on importance of soft skills and their connection with green economy and green professions, there was a consensus and acknowledgement by a considerable number of participants of all focus groups on the value and significance of soft skills in young graduates' personal development and professional life. Moreover, most participants agreed that soft skills are somehow tied to the green economy and can have to some extent a real impact on the behavior, actions and sustainable thinking of a green employee within their working environment, although not to that degree or so directly as their hard skills and technical expertise do in practice. There was an increasing interest from some participants regarding these skills' interrelation with green transition. However, this relationship is not yet that much explored neither in academic community nor in greener economy sectors. Despite this observation, a group of invited stakeholders of the Portuguese focus group mentioned that in fields associated with sustainability and environmental protection, **effective communication, collaboration, and self-management** are seen as indispensable. These skills empower individuals to actively engage in green initiatives and adapt to the evolving demands of the environmentally conscious marketplace. Additionally, participants from the Polish focus group expressed the need to combine specialized learning with soft green skills within STEM courses according to each department' needs and potentials. There should be a visible correlation between basic knowledge and its impact on a sustainable economy or environmental protection. Therefore, **depending on the specialization or profession**, the translation/connection/impact of soft skills in connection with green skills and green economy on the issue in question should be clearly indicated.

Theme 2: Current and desirable soft skills integration pathways in STEM green academic courses

According to the participants' opinions and shared experiences, nowhere in the participating countries soft skills are integrated in the teaching process as stand-alone subjects. This was verified also by many VET participants from the Finnish focus group, mentioning that soft skills are not taught separately but are embedded in the conduct of most everyday activities (how you behave, how you speak/write, how you work in a team and so on). To some extent, there are opportunities where both teachers and students assess in practice a variety of soft skills (e.g., communication, teamwork, and self-management), by receiving for example feedback on how these skills are practised during work placements in companies. Furthermore, participants from Portuguese focus group noted that today's young people are flexible and master these skills better than previous generations. The younger generations exhibit more interest in these skills, as they consider them as important tools to enter successfully the job market in the future, although current

teachers may not be so well-equipped to transfer and teach these soft skills, because their generation might have overlooked it.

Additional experiences were reported and discussed regarding the actual methods that educators current apply soft skills to enhance students' soft skills. For instance, in Finland participants referred to the following actions: i) **Assignments in pairs and groups**, ii) **Real-life projects** (e.g., in the field of construction, students participate in building a real building complex), iii) regarding 'green transition' awareness, educators often express the goals to the students (e.g. '*we want to reduce waste – how can you affect this in your activity...?*') where the students are given free space to determine 'how this can be achieved', by exercising skills such as problem-solving or critical thinking. In Portugal, the teaching methods that have been applied to nurture soft skills in STEM students include: i) **Public Speaking and Presentation Skills**, with activities that improve students' public speaking and presentation skills, promoting effective communication, ii) **Conflict Resolution Training**: Teaching students conflict resolution techniques and strategies to enhance their ability to manage disputes and disagreements constructively, iii) **Leadership Development Programs**: offering leadership development opportunities and programs that empower students to take on leadership roles and responsibilities. In terms of how they envision or would like to see in practice the 'ideal' integration of soft skills in green STEM education, the following figures present indicative examples of the most preferable proposed ideas from Poland, Italy and Greece:

Poland:

By means of teaching by education, that is, imparting theoretical knowledge supported by the practical experience.

Greece:

By means of interactive exercises, organised and systematic training workshops, interaction and common initiatives with green economy sectors.

Italy:

At **organizational** level: soft skill in each disciplinary course, integrate transdisciplinarity / transversal topics for students, extracurricular activities for students, green scenarios / green laboratories, active learning methodologies, mandatory courses/activities for teachers.

At **didactic** level: role plays, case studies, scenario- based learning, soft skills assessment as 'Institutional Learning Outcomes' (ILO) in rubrics of the disciplinary courses, specific focused courses, working in teams (small, multidisciplinary, transdisciplinary).

At **communication** level: involvement of green organizations and institutions, highlight courses' ecological impact when they are communicated, work with students in realizing university communication campaigns on green topics.

Theme 3: Training methods & tools for promoting green 'soft' skills in STEM education

The last part of discussion in the focus groups was related to the training methods and tools that can support the promotion of green soft skills in curricula. Some of the tools that have been identified by the focus group respondents had also been reported by the survey participants, such as role-playing and case studies. The most distinguished tools that stood out by focus groups participants are role-playing activities, educational games, participatory methods, such as problem-based learning, inquiry-based learning, project-based learning, simulations, and share of good practices.

The element of trans/interdisciplinarity appears also as a recurrent way of optimal training methods. For instance, working in multidisciplinary and multicultural teams, or the co-design of collaborative final outputs are a sign that breaking silos between scientific disciplines and pairing people to work together toward producing scientific results, have the benefit of enhancing the soft skills of participants. To that end, workshops that are carried out in transdisciplinary groups are mentioned as effective method.

Interestingly, some methods that have been emerged out of the focus groups discussions entail activities that go beyond university space. Such examples include field experiences of interactions with green economy stakeholders or visiting innovative companies in the relevant domain in order to inspire students for success stories (e.g., with positive impact on students' leadership skill). Finally, it must be stressed that methods related to designing or imagining the future (e.g., Design Thinking) have proposed as beneficial to soft skills cultivation.

Lessons learnt and conclusions

This document presents the SOFTEN Framework, a study that examines the state of art regarding the integration of soft skills, particularly those with an environmental focus or "green soft skills," into Science, Technology, Engineering, and Mathematics (STEM) curricula across six European countries that represent different cultural, technological, socioeconomic, and environmental settings. Through a combination of quantitative and qualitative data collection methods, the Framework identifies trends, status, and gaps in the integration of green soft skills in STEM curricula within selected universities and departments, which in the framework of project work toward the implementation of the SOFTEN educational intervention and the incorporation of soft skills into their teaching trajectories for a sustainable green transition.

As it becomes for the Framework, soft skills around Europe have gained increasing recognition and significance in educational discourse. This is confirmed by the fact that a plethora of educational initiatives and frameworks have been developed by EU institutions, such as the European Framework for Key Competences for Lifelong Learning or the European Sustainability Competence Framework, regarding the importance of transversal competences. These frameworks, which can be regarded as top-down guidance, certainly can support endeavours at national and local level that strive to connect soft skills with the technical dimension of the green transition in the European Higher Education Area (EHEA); however, they are currently limited to the sphere of normative.

When it comes to the local layer, the SOFTEN Framework reveals that small-scale initiatives have flourished in all six countries that serve as case-studies regarding the advancement of soft skills in STEM departments' curricula. This is a positive sign indicating that the transition towards more integrated academic programmes in STEM schools has kicked off. However, it is worth stressing that in these initiatives, the explicit linkage of soft skills with a sustainable green transition is often missing, or at least it is not straightforward enough. Despite the introduction of innovative pedagogies and methodologies in all universities, they are not linked to the green transition, which in turn keeps down potential synergies between green industry stakeholders and STEM departments. As Frameworks developed by the EU do exist, these experimental local initiatives can benefit from establishing clear connection with European policies and priorities, as well as seeking guidance by EU experts for sustainability and upscale.

The state of art at the local level becomes more informative from the analysis of primary data that are collected through semi-structured interviews and surveys. When it comes to the interviews, a promising insight is that the level of familiarity with the concept of soft skills is fairly high by STEM academics and personnel in all countries that serve as case studies. However, in line with the findings of the baseline analysis, the significance of soft skills in the green transition process is

much less clear, whereas the concept of “green soft skills” enjoys poorer recognition. Naturally, fluctuations in the overall level of awareness between countries are observed, and call for customised awareness raising campaigns and initiatives, always with respect to the historic and cultural backgrounds of each nation.

Another intriguing finding of the SOFTEN Framework is that, despite diverse contexts, certain barriers that hinder the further development of soft skills in STEM curricula for the green transition are common in all countries. These barriers pertain both to structural factors, such as rigidity when it comes to the introduction of soft skills in formal programmes, and to micro-level factors, such as low levels of interest, motivation or awareness about soft skills from the side of educational providers. In the light of shared challenges, the Framework shows that sharing of good practices and lessons learnt between European STEM departments can be a way forward to overcoming these barriers. Nevertheless, as most of the barriers pointed out by academic interviewees remain context-specific, customised strategies at national or local level are required.

As far as driving factors are concerned, transnational trends emerge again from the Framework. Institutional resilience and adaptations regarding academic programmes are recurrent factors that can drive forward the integration of soft skills in green transition-related STEM studies in all countries. Closer and stronger collaboration between stakeholders, which implies a clear engagement of external green industry players, stands out as another key factor. Small-scale efforts involving informative workshops are highly proposed by the interviewees, while it should be mentioned that the design and deployment of monitoring tools to measure and showcase the benefit of enhancing the soft skills of university students takes its own merit as a driving factor. Finally, state guidance and support, most times in financial and budgetary terms, is highly considered as a driving factor.

The insight retrieved from the interviews with green industry stakeholders complement the qualitative analysis and render the local landscape of barriers and driving factors more complete. Consistent with the previous results, the analysis showcases that degrees of familiarity with the concept of soft skills by green industry actors vary across countries. At the same time, transnational preferences over specific soft skills that apply in the green transition, are noted. **Teamwork, adaptability, communication, collaboration, open-mindedness, empathy, critical thinking, and problem-solving are applauded by stakeholders.** This finding can form the basic source for collaborative investments between a university and network of green companies of the same local ecosystem; additionally, it can become the focus by joint initiatives on soft skills development between STEM departments of different EU countries.

Moving on to gaps, one should carefully read through the findings to understand that, naturally, green industry stakeholders pay attention to market-related holes. That is to say, former STEM students who enter the green sectors of the labour

market remain poorly qualified when it comes to their soft skills armament, often resulting in suboptimal performance. This is indicative of the complexity of soft skills: it is not only an issue of weak or non-existent training in HEIs, but also a matter of lack of initiatives from the side of industry stakeholders. Gaps in creativity, incidents of risk-aversion, and poor communication skills by the employees are repeatedly mentioned in the interviews. What can be inferred is not just that industry remains fragmented from universities when it comes to soft skills for the green transition, but that linkages between academia, state, and green industry should be urgently cultivated and cemented to develop curricula that not only meet high-quality academic standards, but also remain up to date vis-à-vis the galloping green market developments.

Regarding the driving factors that are put forward by the green industry side, these should be approached as complementary tools to the ones discussed with academic stakeholders. As expected, driving factors differ when moving into the labour market domain: here, the focus is on ongoing training, informal peer monitoring in the workplace, creation of feedback tools, and participation in related conferences and events by the side of employees. Common points of attention and action with driving factors from the side of academic stakeholders can be spotted. For instance, higher adaptability in academic curricula can be combined with lifelong learning initiatives designed and executed by companies and firms. In this respect, VET centres can play a critical role, acting as the interface between STEM departments and the green industry.

The surveys add the last piece of the state of art equation, and, serving as a tool of data triangulation, corroborate the outcomes of the baseline analysis and interviews. Moreover, as the surveys have enabled the collection of larger amounts of data, they reveal more generalised patterns, compared to the interviews. The descriptive statistics show that even though the concept of soft skills is known by the sampled students across the six countries, participants are less acquainted with the concept's connection with the green transition. Furthermore, most of them ignore the existence of related initiatives of soft skills advancement in their department or confirm the lack thereof; yet, at the same, most of them seem to value soft skills and are eager to support their teaching.

Communication, problem-solving, creativity, planning and team management are the most selected soft skills when it comes to their importance in relation to their future professional development in green economy sectors, according to the surveyed students. Out of them, communication, problem-solving, and creativity are equally appreciated by STEM academics. This is an important finding, since it highlights types of soft skills whose enhancement needs to be prioritised, as there is consensus on their value concerning the green transition. What can be safely concluded from the surveys is that currently, the supply (i.e., proper integration of soft skills from the side of academic institutions) does not meet the demand (i.e., preferences and needs of STEM students). Regarding the STEM educational

providers who participated in the survey, it is interesting to note that despite high levels of familiarity with the concept of soft skills, more than half of the respondents ignore the concept of “green soft skills”. This confirms a finding that is currently observed throughout the research outcomes: “soft skills” per se are known, but their association with the phenomenon of green transition is still in an infant stage, and substantial effort needs to be put in order this connection become stronger. Another profound finding is that educational providers corroborate students’ opinion that there is poor level of soft skills’ integration in STEM curricula with a focus on green economy. Lastly, most educational providers would be supportive of advancing soft skills in their academic programmes, ideally as part of formal curriculum. Consistency of results and trends, both across data collected through methods, but also across groups of stakeholders, is observed in the SOFTEN Framework. This is a strongly positive sign, as it implies that specific gaps need to be addressed and that certain types of soft skills are embraced both by students and professors. Moreover, there is a multi-stakeholder agreement on the need for practical action toward incorporating soft skills in sustainability-related STEM programmes. As such, the Framework offers a solid theoretical basis, upon which the SOFTEN project builds its practical interventions in the pilot universities.

Bibliography

Glossary - terminologies:

Green economy:

Manchester City Council. (2023). Green skills and careers. https://www.manchester.gov.uk/info/100008/work_jobs_training_and_advice/8480/green_skills_and_careers/8

Green jobs:

ILO (2011). GREENING THE GLOBAL ECONOMY - THE SKILLS CHALLENGE.

https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_emp/@ifp_skills/documents/publication/wcms_164630.pdf

Green transition:

Law Insider (n.d.) Green transition definition.

<https://www.lawinsider.com/dictionary/green-transition> & The beautiful truth. What is The Green Transition? (2022). <https://thebeautifultruth.org/the-basics/what-is-the-green-transition/>

Skills for the green transition:

Cedefop (2022a). Cities in transition: how vocational education and training can help cities become smarter and greener. Luxembourg: Publications Office. Policy brief.

Green skills:

CEDEFOP (European Centre for the Development of Vocational Training). (2012). strategy for green skills? A study on skill needs and training has wider lessons for successful transition to a green economy: Briefing Report. Greece: European Centre for the Development of Vocational Training. <https://www.cedefop.europa.eu/el/news/strategy-green-skills>

OECD (2014). Greener Skills and Jobs. <https://www.oecd.org/greengrowth/greener-skills-and-jobs-9789264208704-en.htm>

Soft skills:

Kenton, W. (2023). What Are Soft Skills? Definition, Importance, and Examples. *Investopedia*. <https://www.investopedia.com/terms/s/soft-skills.asp> &

Kaplan, Z. (2023). What Are Soft Skills? Definition and Examples. *Forage*. <https://www.theforage.com/blog/basics/what-are-soft-skills-definition-and-examples>

Executive summary:

Cedefop (2023). Skills in transition: the way to 2035 Luxembourg: Publications Office. <http://data.europa.eu/doi/10.2801/438491>

https://www.cedefop.europa.eu/files/4213_en.pdf?fbclid=IwAR21Jl1hsltvxlAFYvauZXFo32POB0aX5iDUdgvCR4bAm4_G04B9SR-W8YY

ILO. (2015). SKILLS FOR GREEN JOBS. https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---ifp_skills/documents/genericdocument/wcms_461268.pdf

Global Deal (2023), Upskilling and reskilling for the twin transition: The role of social dialogue. <https://www.theglobaldeal.com/resources/Upskilling-and-reskilling-for-the-twin-transition.pdf>

Chapter 1:

Kwauk, C. (2021). The road to a net-zero economy requires building girls' green skills for green jobs. Retrieved from: <https://www.brookings.edu/blog/education-plus-development/2021/03/01/the-road-to-a-net-zero-economy-requires-building-girls-green-skills-for-green-jobs/>

Karimi and Piña (2021). Strategically Addressing the Soft Skills Gap Among STEM Undergraduates. *Journal of Research in STEM Education*. Vol 7, No 1, July 2021, 21-46. <https://doi.org/10.51355/jstem.2021.99>

Maclean, R. et. al. (2018). Education and Skills for Inclusive Growth, Green jobs and the Greening of Economies in Asia. Vol. 27. Springer.

Miguel, J. (2020). STEM students are not learning the soft skills they need after graduation. Retrieved from: <https://www.statepress.com/article/2020/11/spopinion-stem-students-arent-learning-the-soft-skills-they-need-to-succeed-after-graduation>

CEDEFOP (2021). Green skills and environmental awareness in vocational education and training. Retrieved from: https://www.cedefop.europa.eu/files/5524_en.pdf

ARTHUR, C. (2021). What are green skills? UNIDO. Retrieved from: <https://www.unido.org/stories/what-are-green-skills>

Robson, C., & McCartan, K. (2016). *Real World Research* (4th ed.). Wiley. <https://www.wiley.com/en-gb/Real+World+Research%2C+4th+Edition-p-9781119144854>

Chapter 3:

Bianchi, G., Pisiotis, U., Cabrera Giraldez, M. GreenComp – The European sustainability competence framework. Bacigalupo, M., Punie, Y. (editors), EUR 30955 EN, Publications Office of the European Union, Luxembourg, 2022; ISBN 978-92-76-46485-3, doi:10.2760/13286, JRC128040. <https://publications.jrc.ec.europa.eu/repository/handle/JRC128040>

Dall'Amico, E., Verona S. (2015). CROSS-COUNTRY SURVEY ON SOFT SKILLS REQUIRED BY COMPANIES TO MEDIUM/HIGH SKILLED MIGRANTS. Methodological approach for a common framework of Soft Skills at work. https://ec.europa.eu/programmes/erasmus-plus/project-result-content/dce32717-6cfc-4b23-b7af-e4effad68f21/Framework_soft_skill_Report.pdf

European Commission. (2011), Transferability of Skills across economic sectors: role and importance for employment at European level. Luxembourg, Office for Official Publications of the European Communities.

Geektonight. (2023). What are Soft Skills? Types, Importance, How to Develop. https://www.geektonight.com/soft-skills/?utm_content=cmp-true

Korolyova, L. et al. (2021). Developing soft skills for sustainable development in environmental engineering students through foreign language learning. E3S Web of Conferences 295, 05005 (2021). WFSDI 2021.

World Economic Forum. (2020). These are the top 10 job skills of tomorrow - and how long it takes to learn them. Retrieved from: <https://www.weforum.org/agenda/2020/10/top-10-work-skills-of-tomorrow-how-long-it-takes-to-learn-them/>

Pratt, M. (n.d.). Soft skills. Techtarget. <https://www.techtarget.com/searchcio/definition/soft-skills>

Sala, A., Punie, Y., Garkov, V. and Cabrera Giraldez, M., LifeComp: The European Framework for Personal, Social and Learning to Learn Key Competence, EUR 30246 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-19418-7, doi:10.2760/302967, JRC120911. <https://education.ec.europa.eu/focus-topics/improving-quality/key-competences> &

<https://publications.jrc.ec.europa.eu/repository/handle/JRC120911>

SoftSkills4EU. (n.d.). SoftSkills4EU: Promote your Soft Skills with Open Badges. https://softskills4.eu/wp-content/uploads/2020/10/Soft-skills-Framework_O1A2_ENG.pdf

Chapter 4 - Step 1 (Baseline analysis):

Agenzia Nazionale, Politiche Attive, & Lavoro, D. (2021). LE COMPETENZE GREEN ANALISI DELLA DOMANDA DI COMPETENZE LEGATE ALLA GREEN ECONOMY NELLE IMPRESE, INDAGINE 2021. https://excelsior.unioncamere.net/images/pubblicazioni2021/CompetenzeGreen_2021.pdf

Aalto University. Urban Studies and Planning, M.Sc in Architecture. <https://www.aalto.fi/en/study-options/masters-programme-in-urban-studies-and-planning-msc-in-architecture>

Anvur conference. (2017). MISURARE LE COMPETENZE NELL'UNIVERSITÀ ITALIANA. Retrieved from https://www.anvur.it/wp-content/uploads/2019/03/sintesi-dei-contributi_workshop040417-1.pdf

Bellini, C., Annamaria DE SANTIS, Sannicandro, K., & Cecconi, L. (2020a). Dalla formazione dei docenti alle competenze trasversali degli studenti: un progetto di faculty development presso l'Università di Modena e Reggio Emilia. Retrieved from <https://iris.unimore.it/handle/11380/1207203>

- Bellini, C., Annamaria DE SANTIS, Sannicandro, K., & Cecconi, L. (2020b). Dalla formazione dei docenti alle competenze trasversali degli studenti: un progetto di faculty development presso l'Università di Modena e Reggio Emilia. Retrieved from <https://iris.unimore.it/handle/11380/1207203>
- Caggiano V, Schleutker K, Petrone L, González-Bernal J. (2020). Towards Identifying the Soft Skills Needed in Curricula: Finnish and Italian Students' Self-Evaluations Indicate Differences between Groups. *Sustainability*. 12(10):4031.
- Capaldi, D., & Ragone, G. (2019). I transversal skills. Un passaggio obbligato. *SCUOLA DEMOCRATICA*, 1/2019, 103-122. ISBN: 978-88-15-28291-0.
- Chignoli, V., Leone, E., Carbone, F., Carotenuto, A., & Alberto De Lorenzi. (2020). Le competenze trasversali nella formazione universitaria: un percorso online di sviluppo delle soft skills per l'inserimento nel mondo del lavoro dei giovani neolaureati. *Reports on E-Learning, Media and Education Meetings*, 8, 76-81. Retrieved from <https://www.je-lks.org/ojs/index.php/R-EMEM/article/view/1135161>
- Cinque, M., Carretero, S., & Napierala, J. (2021). Non-cognitive skills and other related concepts: towards a better understanding of similarities and differences (No. 2021/09). JRC Working Papers Series on Labour, Education and Technology.
- Ferrero, V. (2022). Competenze non cognitive, equità e sviluppo olistico della persona. Riflessione pedagogica e spunti di lavoro. *Q-TIMES WEBMAGAZINE*, 14(2), 41-52. <https://www.qtimes.it/?p=non-cognitive-skills-equity-and-holistic-personal-development-pedagogical-reflection-and-working-ideas>
- Fondazione Cariplo. (2017). *LO SVILUPPO DEI GREEN JOBS - Uno scenario di evoluzione quantitativa e qualitativa e alcune ipotesi di adeguamento dei percorsi formativi* - Google Search. Retrieved from https://www.fondazionecariplo.it/static/upload/qua/0000/qua_25-greenjobs_web3.pdf
- Fondazione CRUI. (2017). *LE COMPETENZE TRASVERSALI PER L'HIGHER EDUCATION*. Fondazione CRUI. Retrieved from Fondazione CRUI website: www.fondazionecruai.it Link: https://www2.cruai.it/cruai/quaderno_osservatorio_1.pdf
- Gagliardi, L., Marin, G., & Miriello, C. (2016). The greener the better? Job creation effects of environmentally-friendly technological change. *Industrial and Corporate Change*, 25(5), 779-807. <https://doi.org/10.1093/ICC/DTV054>
- Imperio, A., & Basso, D. (2022). The TASC learning framework for the education of non-cognitive skills: Applications in schools of all levels. *ITALIAN JOURNAL of EDUCATIONAL RESEARCH*, (29). <https://doi.org/10.7346/SIRD-022022-P92>
- Lotti, A., Crea, G., Garbarino, S., Picasso, F., Scellato, Erika. (2021). Faculty Development e innovazione didattica universitaria. Genoa University Press. <https://gup.unige.it/faculty-development-e-innovazione-didattica-universitaria>

Schleutker, K., Caggiano, V., Coluzzi, F., & Poza Luján, J. (2019). Soft Skills and European Labour Market: Interviews with Finnish and Italian Managers. *Journal of Educational, Cultural and Psychological Studies (ECPS Journal)*, 0(19), 123-144.

Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG). (2015). In <https://www.enqa.eu/>. Brussels, Belgium. Retrieved from https://www.enqa.eu/wp-content/uploads/2015/11/ESG_2015.pdf

Vona, F., Marin, G., Consoli, D., & Popp, D. (2015). Green skills. Retrieved from https://www.nber.org/system/files/working_papers/w21116/w21116.pdf

Wallace, B., Alessio Bernardelli, Molyneux, C., & Farrell, C. (2012). TASC: Thinking Actively in a Social Context. A universal problem-solving process: A powerful tool to promote differentiated learning experiences. *Gifted Education International*, 28(1), 58-83. <https://doi.org/10.1177/0261429411427645>

Phelps, E. S. (2014). Why teaching humanities improves innovation. Retrieved from: <https://www.weforum.org/stories/2014/09/stem-education-humanities-creativity-innovation/>

Ferreira, J., Paço, A., Raposo, M., Hadjichristodoulou, C., & Marouchou, D. (2021). International entrepreneurship education: Barriers versus support mechanisms to STEM students. *Journal of International Entrepreneurship*, 19(1), 130-147.

Juškevičienė, A., Dagienė, V., & Dolgopolovas, V. (2021). Integrated activities in STEM environment: Methodology and implementation practice. *Computer Applications in Engineering Education*, 29(1), 209-228.

Kapitulčinová, D., Dlouhá, J., Ryan, A., Dlouhý, J., Barton, A., Mader, M., Tilbury, D., Mulà, I., Benayas, J., Alba Hidalgo, D., Mader, C., Michelsen, G., & Mally, K. (2015). Leading Practice Publication: Professional Development of University Educators on Education for Sustainable Development in European Countries.

Martinaitis, Z., Arregui-Pabollet, E., & Stanionyte, L. (2020). Higher education for smart specialisation: The case of Lithuania. Joint Research Centre (Seville site).

Poviliūnas, A. (2019). Apie STEM pro STM prizmę. ISSN 1392-5016 eISSN 1648-665X *Acta Paedagogica Vilnensia* 43

Szewczuk K. (2021). Zaangażowanie studentów kierunków nauczycielskich w edukację STE(A)M – przykłady dobrych praktyk (Involvement of Students of Teaching Specializations in the STE(A)M Education. Examples of Good Practices), „Edukacja Elementarna w Teorii i Praktyce”, vol. 16, nr 5(63), s. 37-51. DOI: [10.35765/eetp.2021.1663.03](https://doi.org/10.35765/eetp.2021.1663.03)

Giza T. (2016). Zmiany w polityce oświatowej a jakość wsparcia dla uczniów zdolnych (Changes in educational policy and the quality of support for gifted students), [in:] J. Aksman, K. Grzesiak (eds.), Państwo i społeczeństwo. Edukacja alternatywna a współczesna szkoła (State and society. Alternative education and modern school). Kraków: Oficyna Wydawnicza AFM, pp. 13-25.

Kranc M. (2019). STEM Education on the Example of the “Physics for Kids” Project Implemented in the Hippo Art Non-Public Kindergarten in Wieliczka: Research Reports. “Edukacja Elementarna w Teorii i Praktyce,” vol. 14, no. 4(54), pp. 95-107. DOI: 10.35765/eetp.2019.1454.07.

NOVIA University of Applied Sciences (n.d). Natural Resources Management, 2023. Study Guide. <https://studieguide.novia.fi/en/13625/en/113240/HYH23H-NRM/year/2023>

TURKU AMK. Capstone Innovation Projects.
<https://www.turkuamk.fi/en/service/capstone-innovation-projects/>

UTAD. (2021). Plano das Soft-Skills UTAD | 8ª Edição. https://www.utad.pt/gform/wp-content/uploads/sites/25/2021/10/Regulamento_Softskills-8aEdicao-v4.pdf

UTAD. (2021). Skills for Life. PROGRAMA IMPULSO JOVENS STEAM E IMPULSO ADULTOS. CONTRATO-PROGRAMA DE FINANCIAMENTO no âmbito do Plano de Recuperação e Resiliência (PRR) para 2021-2026. https://wwwcdn.dges.gov.pt/sites/default/files/2_utad_final_signed.pdf

Annexes

Annex 1: Reporting templates for interviews

i) Template for reporting the interviews with STEM educational providers:

Reporting template after the interview with STEM educational providers	
Academic field/ type of STEM field of interviewee	
<p>Introductory (Opening) part:</p> <p>You make a summary in the next column (green) of the ratings (scale 1 to 5) of the interviewee for the following questions:</p> <p><i>How familiar are you with the concept of 'soft skills'?</i></p> <p><i>How important do you believe soft skills are considered by professionals in the work place?</i></p> <p><i>How critical do you believe, yourself, soft skills are towards supporting the green transition?</i></p>	
<p>Main part:</p> <p>Category 1: current situation and perceptions on soft 'green' skills</p> <p>What is the level of integration of soft skills in the curricula of their department or school?</p> <p>Is he/she aware of any initiatives or good practices that focus on soft skills in relation to green transition or sustainable development or be part of STEM curricula and studies of their department?</p> <p>Next, you make a summary of the ratings of the ratings (scale 1 to 5) of the interviewee for the following questions:</p> <p><i>How important do you believe soft skills are considered by your university in its education programmes?</i></p>	

<p><i>How important do you believe soft skills are considered by lecturers in their own specialty field?</i></p> <p><i>How important do you believe soft skills are considered by students?</i></p> <p>When it comes to the green transition, which soft skills does the interviewee consider as the most important for their students to acquire? (next to the summary of ratings)</p>	
<p>Category 2: discovering barriers and obstacles</p> <p>What type of major limitations and problems were mentioned by the interviewee regarding the integration of soft skills in their STEM department or university in general?</p> <p>In his/her opinion, which are the factors that can most seriously threaten any initiatives from colleagues of their department or university on soft skills training with a green orientation?</p>	
<p>Category 3: understanding driving factors and enablers</p> <p>Factors that motivate changes in their university or schools to implement training initiatives on soft skills development (in relation to the green transition)</p> <p>Ways through which soft skills of students and young graduates could be better developed to be able to better enter and support the green transition after entering the job market.</p>	
<p>Closing part:</p> <p>Information as part of follow-up questions – additional comments by interviewee (if any)</p>	

ii) Template for reporting the interviews with green industry stakeholders:

Reporting template after the interview with green industry stakeholders	
Field/ sector of green economy in which the interviewee is currently involved/ employed	
<p>Introductory (Opening) part:</p> <p>You make a summary in the next column (green) of the ratings (scale 1 to 5) of the interviewee for the following questions:</p> <p><i>How familiar are you with the concept of 'soft skills'?</i></p> <p><i>How important do you believe soft skills are considered by professionals in the work place?</i></p> <p><i>How critical do you believe, yourself, soft skills are towards supporting the green transition?</i></p>	
<p>Main part:</p> <p>Category 1: current needs of soft skills in green economy</p> <p>The soft skills that are expected to become more important in the upcoming decade, in his/her opinion.</p> <p>The most important soft skills that a new employee should have in their 'green' sector in order to succeed and adapt to green transition.</p> <p>Next, you make a short summary of their rating in the following question: <i>From 1 to 5 (where 1 means not at all and 5 very much) How much in your opinion</i></p>	

<p><i>does the development of green 'soft' skills influence the portfolio of your company?</i></p>	
<p>Category 2: discovering gaps</p> <p>What type of major limitations and problems the interviewed green industry stakeholder mentioned when it comes to the soft skills of their employees?</p> <p>How, in their opinion, these gaps affect the adaptability and productiveness of their employees to sustainability and greening processes in their sector?</p>	
<p>Category 3: initiatives and benefits</p> <p>Did the interviewee mention any practice or training initiatives on employees' soft skills development in their sector in order to cultivate a critical thinking, a sustainable mindset and other virtues related to soft skills for the green transition?</p> <p>In their opinion, what particular benefits would the acquisition of soft skills by an employee bring to themselves and their sector in general for a more green mindset?</p>	
<p>Closing part:</p> <p>Information as part of follow-up questions – additional comments by interviewee (if any)</p>	

Annex 2: Interview guide

1. Objectives and target groups

The interviews will complement the desk research regarding existing trends on soft skills integration in STEM curricula in each country. The collected information of interviews will be reported in a form of short templates.

The interviews will identify **current shortages & needs** about the integration of soft skills in STEM green curricula, as well as demands on soft skills from the side of green economy sectors. The collected information will help us understand better the perception of both educational providers and green economy stakeholders about the benefits and role of soft skills for STEM graduates' professional development (as future and potential employees in their sector). Another goal of interviews will be to capture the level of awareness of these stakeholders on existing initiatives that promote soft skills in their field and on obstacles or difficulties that hinder the further development of these skills in conjunction with the preparedness of young graduates from STEM fields towards the green transition.

Each participating country should conduct 10 semi-structured interviews in total. The interviews were divided into two parts: **5 interviews with STEM educational providers** who come from different STEM departments, ideally with a green orientation (e.g., engineering, environmental studies, natural, physical & life sciences, technology-related disciplines, etc.) and **5 interviews with green industry stakeholders/ representatives** (employers, self-employed, managing directors, etc.) who are active in various green economy sectors.

Examples of green economy areas¹³:

Bioeconomy, circular economy, green buildings, green energy, renewable energy, agriculture, sustainable tourism, green cities, green transport, waste management, etc.

Duration of interviews

Each interview will last **maximum 35-40 minutes**. This is recommended to avoid fatigue or discouragement from the side of interviewee.

We do not recommend having breaks (unless it is requested by the interviewer/ interviewee for very specific reasons) as the duration is very short and there is a risk of the interviewee becoming distracted

Basic rules to conduct the interviews

- In order to schedule the interview, you should send the invitation letter and consent form to the invited stakeholder. Once the candidate gives officially their consent, you will proceed with setting up the interview.

¹³ Examples of green economy: https://www.researchgate.net/figure/The-main-sectors-of-the-green-economy_fig1_339662333 & <https://www.analyticssteps.com/blogs/what-green-economy>

- The interview can be conducted either physically or virtually via an online platform (e.g., Zoom, Teams, Google Meet or Skype).
- In case the interviewee gives their consent for a recording in the online interview, you will provide to Stimmuli only the transcribed text. The original recorded interview should remain secured only in the databases of your organisation.
- During the actual interview, if the participant is struggling to provide an answer you can help them by giving an example.
- Apart from introducing SOFTEN to the interview at the beginning of the interview, you can also send them the social media accounts:
 - ✓ <https://www.facebook.com/softenproject>,
 - ✓ <https://www.linkedin.com/company/soften-project/>
- You will report each interview's results in a short reporting template that will be provided by Stimmuli. There will be **2 different summary templates**: one for the interviews with STEM educational providers and one for the interviews with the green industry stakeholders. **After each interview you will fill in the reporting template. Stimmuli will receive in total 10 completed reporting templates.**
Once you complete the summary templates, you will upload them in our common Drive folder.
- Note to university partners: you can recruit STEM education providers either from your own university or from other STEM green-oriented departments in your country. The other partners (Stimmuli & Inova) can select STEM providers from the largest university of their ecosystem.
- For the interviews in Lithuania, Xwhy will collaborate with KTU and conduct together or divide the number of interviews as they come from the same country.
- Ideally, we recommend that **different** university schools and green economy sectors be covered by the interviews. This will **enhance the representativeness of results** and also reveal potential sectoral specificities.

Questions for each target group

In order for all interviews to have a consistency and offer insight in an effective way for our work, we suggest that all partners in each country conduct the interview process in the following way:

PART 1 | OPENING SESSION (WARM - UP) | appr. 8' to both university and entrepreneurs interviewees:

Brief introduction of ourselves, of SOFTEN project and of the goal of interview process. Random questions to make interview feel comfortable and break the ice. The goal is to create rapport and a good atmosphere as also to have a good flow throughout the discussion to receive useful information.

Intro questions for the interviewee:

1. "How long have you been in the position you are now?"
- 2 We next focus on the topic by introducing soft skills with a statement: *During the last years, we have often heard of soft / transversal / life skills which are defined as 'skills that include interpersonal (social) skills and intrapersonal (individual cognitive) skills that help employees interact with other persons and perform successfully in working tasks and in their professional career'.*

Note: before we move on to next questions, we can give them a couple of examples of soft skills. We generally suggest working with soft skills categories comparing to very precisely defined soft skills titles. Using categories allows the interviewees to have in mind and pick up a variety of such skills.

Indicative examples of the most important categories of soft skills:

- Communication skills (such as influencing, negotiation skills, active listening, presenting, leadership)
- Self-management (such as planning, time management, goal orientation, persuasiveness, agency, taking the initiative, self-control, self-confidence, commitment, self-awareness)
- Intellectual/cognitive skills (such as problem solving, creativity, learning from experience, analytical skills, analytical thinking, critical thinking)
- Team management (cooperation, work in team, adaptability)

3. Some '*breaking the ice*' questions to help them express more easily their opinion and get into the topic:

- *How familiar are you with the concept of 'soft skills'?*

1	2	3	4	5
Not at all	A little familiar	Neutral	Familiar	Very familiar

- *How important do you believe soft skills are considered by professionals in the work place?*

1	2	3	4	5
Not at all	Not important	Neutral	Important	Very important

- *How critical do you believe, yourself, soft skills are towards supporting the green transition*?*

1	2	3	4	5
Not at all	Not very critical	Neutral	Critical	Very critical

We show them this rating in each of the above questions and next put a X in the box that is related to his/her answer.

* Note: The green transition means a shift towards economically sustainable growth and an economy that is not based on fossil fuels and overconsumption of natural resources.

Note: If you have any better idea to design this rating online feel free to do it, but it is important to keep the same rating.

PART 2 | MAIN PART (CORE QUESTIONS) | Appr. 25-27'

2.1 STEM educators version

“We can now proceed with the main part of our interview. We want to ask you some general questions that regard your personal experiences, perspectives and views on the development and integration of soft skills in the curriculum of your department/school/university. I recall that there are no wrong or correct answers; we only want to hear your opinion. In case you don't understand a question or you want us to clarify, do not hesitate to say so.”

Category 1: current situation and perceptions on soft 'green' skills (appr. 10')

- *“What is the level of integration of soft skills in the curricula of your department or school?” Are you aware of any initiatives or good practices that focus on soft skills in relation to green transition or sustainable development or be part of STEM curricula and studies of your department?*

Here he/she answers openly, without ratings.

Follow-up question: *Can you give me/us a couple fo examples?*

Next questions: you can also use a rating scale (as in introduction), as follows:

- *How important do you believe soft skills are considered by your university in its education programmes?*

1	2		3	4	5
Not at all	Not very important		Neutral	Important	Very Important

- *How important do you believe soft skills are considered by lecturers in their own specialty field?*

1	2	3	4	5
Not at all	Not very important	Neutral	Important	Very Important

- *How important do you believe soft skills are considered by students?*

1	2	3	4	5
Not at all	Not very important	Neutral	Important	Very Important

We show them this rating in each of the above questions and next put a X in the box that is related to his/her answer.

- *'When it comes to the green transition, which soft skills you consider the most important for your students to acquire?'*

For this question, let them express openly their opinion , not through ratings, and you can take notes.

Note: Here we can help interviewee by giving some examples of what we mean as soft green skills: *green skills do not include only hard skills or cognitive skills but also a variety of interpersonal competencies (such as communication, negotiation skills) and intrapersonal competencies (such as adaptability, innovation, openness to new ideas promoting sustainability) that were mentioned previously in the core definition of soft skills.*

Source for generic green skills:

<https://www.greenskillsresources.com/category/generic-green-skills>

Category 2: discovering barriers and obstacles (appr. 8')

"What type of major limitations and problems have you been observing in the integration of soft skills in your STEM department or university in general?"

“In your opinion, which are the factors that can most seriously threaten any initiatives from colleagues of your department or university on soft skills training with a green orientation?”

Category 3: understanding driving factors and enablers (appr. 7')

“In your opinion, which factors would motivate changes in your university or schools to implement training initiatives on soft skills development?”

or

“how do you think soft skills of students and young graduates could be better developed to be able to better enter and support the green transition after entering the job market?”

Summary for the available time:

- i) Opening 6- 7'
- ii) Main part 25- 27'
- iii) Closing part 5'

2.2. Green industry representatives version - Main part (same introduction) – total duration: 25-27'

‘We can now proceed with the main part of our interview. We want to ask you some general questions that regard your opinion and perceptions when it comes to soft skills that are needed and missing from the side of new employees in your sector. I recall that there are no wrong or correct answers; we only want to hear your opinion. In case you don't understand a question or you want us to clarify, do not hesitate to say so.’

Category 1: current needs of soft skills in green economy (appr. 10')

- “Since green transition is an ever-evolving process, which soft skills do you believe are expected to become more important in the upcoming decade?”
- “What are the most important soft skills that a new employee should currently have in your sector in order to succeed and adapt to green transition?”

Note: as suggested with STEM educ. providers, we can do the same with green industry stakeholders when it comes to the introduction to soft skills¹⁴, first we make a short introduction about what we mean as ‘soft skills’ and next we mention their connection with generic green skills.

¹⁴ You can be inspired by taking ideas from Part 1 (Intro) and Category 1 from Part 2 of the previous pages.

- From 1 to 5 (*where 1 means not at all and 5 very much*) How much in your opinion does the development of green ‘soft’ skills influence the portfolio of your company?

The give their answer through the following rating:

- a. Not at all
- b. Not so much
- c. Neutral
- d. Much
- e. Vey much

Category 2: discovering gaps (appr. 8')

“What type of major limitations and problems have you been observing when it comes to the soft skills of your employees?”

“How these gaps affect the adaptability and productiveness of your employees to sustainability and greening processes in your sector?”

Category 3: initiatives and benefits (appr. 7')

“What types of initiatives have you been observing about training initiatives on employees’ soft skills development in your sector for the green transition?”

“What particular benefits would the acquisition of soft skills by an employee bring to themselves and your sector in general for a more green mindset?”

PART 3 | CLOSING (CLEAN - UP) | Appr. 5'

“Would you like to follow up on any things I might have not asked you?”

“Do you have any final thought to share?”

We close the interview by saying: “*Thank you for your time and for sharing your opinion*”.

We can ask to ask the interview if he/she agrees to be informed in the future for next activities of the project (e.g., to send a newsletter to his/her email, to invite him/her for a workshop or any other engagement activity, etc).

Summary for the available time:

- i) Opening part: 6- 7'
- ii) Main part: 25- 27'
- iii) Closing part: 5'

Annex 3: Links of surveys (Step 3)

- i) Survey for STEM students:

https://docs.google.com/forms/d/e/1FAIpQLSe_BiXF0SYjWwQw6slwRTtBjj6CDVw2A_6ip2kaDffl0A0pOg/viewform

ii) Survey for STEM educational providers:

<https://docs.google.com/forms/d/e/1FAIpQLSf6Z4hI70EkznAtBz9fD-x8VmYj82B7qoDPHQE5mAwlpfmGxw/viewform>

Annex 4: Consent form and invitation letter for interview participants (Step 2)

i) Consent form

SOFTEN - Embedding soft skills in STEM academic curricula for the transition to sustainable green economy

Project number: 2022-1-PL01-KA220-HED-000085725

Consent form for interviews under WP2

I the undersigned declare that:

- ❖ I have been informed by (full name of the researcher who will conduct the interview by your team) for the purposes of the research in which I will participate in the framework of SOFTEN project, funded by the Erasmus+ programme.
- ❖ I have been informed about specific objectives of the interview process in the invitation letter I had been provided with, in addition to this consent form.
- ❖ I am aware that my participation is voluntary and that I can withdraw my participation from the research at any time for any reason and without any impact on me.
- ❖ I have been informed that I can contact the responsible person who will interview me to withdraw my participation from this research or to notify any potential problem that might arise during my participation or after the completion of this research process.
- ❖ I give my consent for the interview to be recorded for the purpose of the analysis.

Yes

No

Note: The recorded interviews will be stored and properly secured by the interviewer on behalf of each responsible partner for their country. The recorded interviews will not be shared with other parties of the project consortium, nor with any other party outside the organisation of the interviewer. All data will be properly anonymised in the analysis of collected information, as part of SOFTEN framework, to ensure that there will be no identification of the interviewee.

- ❖ I agree to be contacted and informed on time by the SOFTEN consortium to share any information about the story of my organisation and other examples or good practices of my field that may be useful for the content of future activities of the project.
- ❖ I have been informed about all my rights as interviewee.
- ❖ I have been informed about how my personal data related to this research is processed and protected, according to (GDPR)¹⁵ of the European Commission.

I finally give my consent to participate in this interview for the purposes of SOFTEN project research activities.

Please put X or ✓ (tick symbol) in Yes box if you agree to participate or No box if you don't agree to participate.

Yes

No

Participant's Signature:

Date:

(day/month/year)

Thank you for your collaboration!

¹⁵ Available here: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02016R0679-20160504&qid=1532348683434>

ii) Invitation letter

Dear XX,

We invite you to participate in an interview in the framework of SOFTEN project research activities, during which you will share your opinions and any relevant information that pertain to the scope of our research activities.

Objectives of this interview:

This interview is part of a series of research activities of the project. Desk research has already been performed by each partner organisation for their country. The interview aims to enrich the findings of the desk research about existing good practices, current educational or professional gaps, needs, and relevant barriers regarding the integration of soft skills in STEM curricula, as well as types of soft skills that are currently considered important by representatives of green industry stakeholders.

Rules of the interview:

- | |
|--|
| 1. The participation in the interview is voluntary and the participant can withdraw at any time his/her participation. |
| 2. We ensure anonymity and confidentiality of the research participants, in line with the (GDPR) by the EC. All information provided during the interview will be anonymised. |
| 3. All your personal data that could identify you will be removed. In case any recording process is selected for the facilitation of the interviewers for gathering the needed information, it should be done with the consent of the interviewee and be used only for the research purposes . |

Practical information:

Date of the interview: the date will be agreed between the interviewer and interviewee and should be convenient for both parties.

Duration of the interview: max. 30 minutes

Language in which the interview will be conducted: [your national language]

If you are interested in participating in the interview, please inform [name of interviewer] by XX/XX/2023.

Contact details of interviewer(s):

Email: XX

Phone: XX

Recording: In the consent form, you will be able to agree or disagree with the possibility of recording the interview. In case you disagree, you will still be able to participate in the interview, as long as you consent with the rest of the terms.

Note: You can take part in the interview only once you have given your consent form (in the respective document).

Annex 5: Focus group reporting template (Step 4)

Name of partner organisation	
Date(s) that the focus group(s) held	
Duration of focus group	
Form of event (F2F or online)	
In case of online focus group, please specify the venue or platform where the focus group was hosted e.g., Zoom, Teams Google Meet, etc.)	
Number of facilitator(s) in the focus group	
Number of participants (actual number) – no names of participants!	
Topics of discussion	
Did you apply any activity different from the suggested ones?	
If yes, please briefly describe its scope and why you selected this activity in the focus group.	
Reactions/ feedback/ suggestions by participants for the framework’s findings and/ or from interactive sessions/ activities	
Additional comments (if any)	
Photos from your focus group (once you get the consent from your participants)	

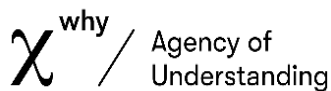
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