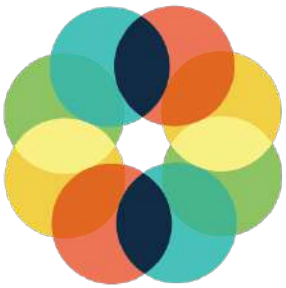

Come ThinkAgain

Certification based Education Training System

ComeThinkAgain Stakeholder Workshop Report

Grant Agreement Number: 101139845
Project Acronym: ComeThinkAgain
Funding Scheme: ERASMUS Lump Sum Grants

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Glossary of Terms

Challenge-Based Learning	Engaging learners in solving real-world challenges using innovative solutions.
Competence-Oriented Teaching	Teaching methods focusing on developing specific skills and competences.
Competences	A combination of knowledge, skills, and attitudes enabling individuals to perform tasks effectively in specific contexts.
Computational Thinking (CT)	A problem-solving process involving concepts like decomposition, pattern recognition, abstraction, and algorithm design.
Critical Thinking	The ability to objectively analyze and evaluate information to form reasoned conclusions.
Digital Literacy	The ability to effectively use digital tools and resources for communication, learning, and problem-solving.
Entrepreneurship and Innovation	The capacity to identify opportunities, create solutions, and implement new ideas effectively in business or other ventures.
Experiential Learning	Learning through direct, hands-on experiences like projects or simulations.
Green Skills	Abilities and knowledge required to support sustainable development and adapt to the transition to a green economy.
Higher Education Institutions (HEIs)	Universities and colleges providing advanced education and research opportunities.
Lifelong Learning	A continuous, self-motivated pursuit of knowledge and skills for personal or professional development.
Micro-Credentials	Digital certifications recognizing mastery of specific skills or competences.
Modular Learning Pathways	Flexible, smaller, independent modules enabling focused learning on specific skills or topics.
Problem-Based Learning (PBL)	An approach where participants learn through solving real-world problems.
Project-Based Learning	Learning through extended projects addressing real-world

	issues.
Quadruple Helix Model	Collaboration among academia, industry, government, and civil society to drive innovation.
Soft Skills	Non-technical abilities such as communication, teamwork, and adaptability essential for professional success.
Transversal Competences	General skills such as problem-solving, adaptability, and collaboration that enhance employability and personal growth.
Vocational Education and Training (VET)	Programs designed to prepare individuals for specific trades or careers through skill-based learning.

Objectives

The ComeThinkAgain project has organized nine co-creation workshops across Europe, engaging 97 participants from higher education institutions (HEIs), vocational education and training (VET) providers, the public sector, and the private sector. These workshops aimed to establish a collaborative dialogue among stakeholders, identify synergies, and address skill gaps and learning demands crucial for the development and implementation of the ComeThinkAgain CETS (Competence and Education Training System). Below are the detailed objectives of these workshops:

Stakeholder engagement: The goal is to involve stakeholders in the co-creation process of the ComeThinkAgain CETS. This includes fostering collaboration in the development of learning content and increasing stakeholder interest in aligning their work with the implementation of the CETS.

Mapping stakeholder needs and expectations: This objective focuses on identifying the needs and expectations of stakeholders across the three competence pillars. The pillars include:

- Computational thinking skills (C1): Aimed at enhancing logical reasoning, problem-solving, and digital literacy.
- Entrepreneurship and innovation skills (C2): Encouraging entrepreneurial mindsets, innovative practices, and adaptability.
- Green skills (C3): Promoting environmental and social responsibility, along with sustainable development.

Curriculum requirements and career pathways: This objective addresses curriculum requirements to improve employability, creativity, and career opportunities. It also emphasizes integrating industry perspectives to foster innovation and problem-solving that align with various economic sectors.

Validation and expansion of competences: The objective is to validate previously identified fundamental learning competences and expand the competences list within the three resilience-related pillars (C1, C2, and C3).

Tools and teaching methods: This involves defining and confirming new tools and methods for teaching computational thinking, entrepreneurship, and environmental sustainability. It also aims to establish didactic approaches and teaching requirements, including simulations and methodologies that emphasize the development of transversal skills.

Knowledge sharing and stakeholder feedback: The objective here is to facilitate knowledge sharing among Higher Education Institutions (HEIs), Vocational Education and Training (VET) institutions, the public sector, and the business sector. Additionally, it aims to gather participant feedback and encourage their involvement in pilot-testing phases.

Community of practice (CoP) development: The final objective is to lay the groundwork for the ComeThinkAgain Community of Practice, encouraging broader discussions and ensuring the sustainability of project outcomes.

Methodology used at the workshops

The methodology employed for conducting the co-creation workshops integrates a variety of collaborative and innovative techniques. These approaches aimed to actively engage diverse stakeholders in discussions and ideation processes, ensuring the generation of meaningful and actionable outcomes. The choice of methodologies has been tailored to suit the conditions of each workshop and the composition of participants, allowing for flexibility and inclusivity in the facilitation process.

The project outlines four primary methodologies as part of the workshop framework selected for their effectiveness in fostering engagement and promoting creativity. The four methodologies outlined in the guide are the following:

1. **World Café** facilitates dynamic discussions on key topics through small group rotations, encouraging diverse perspectives.
2. **SOAR Analysis** focuses on identifying strengths, opportunities, aspirations, and results, providing a structured approach to exploring the project's key pillars.
3. **Design Thinking** employs a human-centred process to empathise, define, ideate, prototype, and test innovative solutions tailored to stakeholders' needs.
4. **Plus/Delta Feedback** gathers constructive feedback on workshop experiences to enhance future iterations.

Across the workshops conducted, a mix of the proposed methodologies listed above was frequently utilized to maximize engagement and outcomes. Given the small number of participants, they were often divided into smaller groups to discuss the three core pillars: Computational Thinking, Entrepreneurial Thinking, and Sustainable Futures. Discussions commonly began with the World Café format to capture a wide range of ideas. Participants then moved into SOAR Analysis sessions, which highlighted key strengths and weaknesses, providing a deeper exploration of the topics. The workshops concluded with Plus/Delta Feedback, where participants shared insights on what worked well and areas for improvement. This iterative feedback loop ensured the refinement of workshop formats, contributing to their ongoing success.

Workshops Calendar and Audience Profile

The nine workshops engaged a total of 75 participants across various stakeholder groups. These groups, as outlined in Table 1, include High Education Institutions (HEIs)/ Vocational Education and Trainings (VETs), the public sector, the private sector, and multipliers.
Table 2 provides a comprehensive overview of the nine workshops schedule, including details of each on the format (online or onsite), number of participants, their language preferences, and their respective stakeholder group.

Table 1: Description of target audiences and stakeholder groups

HEIs/VETs	Public sector	Private sector	Multipliers
HEIs	Public organisations	Influential and representative organisations	Business development organisations
VETs	Public authorities	Local businesses, start-ups, SMEs	Accelerators, Incubators
Private long-life learning organisations	Municipalities	Key industry players, consultancy firms	Non-profit organisations

Table 2: Co-Creation Workshops Calendar and participants information

Country	WS Lead	Online / Onsite	Lan-gua-ge	Nº of par-ticipants	Workshops date	Stakeholder Group			
						HEIs/VETS	Public Sector	Private Sector	Multi-pliers
Austria	PHST/OCG	Online	DE	16	7/11/24	8	4	1	3
Finland	UOULU	Onsite	FI	13	12/12/24	8	3	0	2
Estonia	UTARTU	Onsite	EE	14	25/9/24	12	1	1	0
Denmark	MERCAN-TEC	Onsite	DK	2	27/10/24	0	2	0	0
Germany	GI	Onsi-te/Online	DE	13	25/11/24 & 13/12/2024	5	2	4	2
Spain	INMARK	Onsite	ES	11	22/11/24	2	2	5	2
Ireland	KONNEK-TABLE	Online	EN	4	27/11/24	1	0	1	2
Belgium	SQUARE-DOT	Onsite	EN	10	27/9/24	4	1	2	3
Switzer-land	PHZH	Onsite	DE	14	29/10/24	9	1	3	1
TOTAL				**97**		**49**	**16**	**17**	**15**

Main takeaways

The nine co-creative workshops resulted in several key takeaways, including evaluation strategies, teaching methods, challenges encountered, recommendations, approaches to cross-sector collaboration, and general observations for future directions. These takeaways were as follows:

Selected competences

The table below outlines the selected key competences per pillar gathered from the nine co-creation workshops required in the labor market and for future professionals

C1: Computational Thinking Skills	C2: Entrepreneurship and Innovation Skills	C3: Green skills, environmental and social responsibility and sustainable development
AI literacy • Understanding AI basics and how to work with it effectively • Awareness of biases, data handling, and ethical implications	Creativity and innovation • Creativity • Out-of-the-box thinking • Ideation and innovation competence • Design thinking • Service design • Prototyping and product development • Valuing ideas	Knowledge and awareness • Eco-literacy: Understanding ecological systems, cycles, and the impact of human activities on the environment • Green/basic knowledge (know-how) and knowledge of green legislation

	• Vision • Spotting needs and opportunities	(e.g., European Green Deal) • Awareness of resource consumption and Interpretation of relevant sustainability data • Climate change mitigation strategies and long-term sustainability thinking and planning • Circular economy principles and Responsible value chain • Sustainable development and systems thinking: Considering all stakeholders, different views to sustainability (ecological, social, economical, etc.), sustainability as subjective and contextual, ecocentric vs. technocentric thinking • Ethics and morals: Ethical reasoning, ethical thinking, moral reasoning, and sharing responsibility over the planet and others • Sustainability impact evaluation from the viewpoint of ecological, social, and economic dimensions • Understanding immaterial value beyond monetary (sustainability, ethics)
Data literacy • Understanding data visualization • Knowledge of data organization, standardization, and protection frameworks • Basic statistical knowledge	Strategic and entrepreneurial thinking • Strategic thinking for opportunity identification and growth • Entrepreneurial thinking (understanding economic relationships, calculations) • Business model ge-	Practical and technical skills • Resource optimization (practical knowledge of resource efficiency in one's field of work) • Waste management (e.g., 9R framework) • Eco-design expertise and promoting sustainability in agricul-

	neration • Solution-driven approaches • Ethical and sustainable thinking • Implementing sustainability strategies and measures in business • Transforming challenges into assets • Marketing • Acquiring funding for new business • Integrating values and ethics into innovation processes (sustainable development) • Understanding immaterial value (not only monetary) • Business idea identification and critical reflection (competitors, markets, value)	ture, construction, and transportation • Renewable energy solutions and calculating carbon footprint • Second-hand sales systems and product lifecycle management • Measuring and mitigating carbon and water impacts of technology • Implementation of sustainability strategies and measures in business • Artificial intelligence and data analytics for sustainability purposes
Critical thinking • Evaluating information critically, including models like LLMs (Large Language Models) and their outputs. • Applying logical and analytical thinking • Logical and analytical thinking • Identifying and addressing the core problem (problem setting) • Breaking down complex issues into manageable parts (problem decomposition) • Recognizing patterns and potential solutions • Evaluating solutions critically in relation to the problem • Goal setting and impact analysis • Combining insights	Teamwork and leadership • Leadership and teamwork skills for inspiring and guiding teams • Collaboration skills • Building high-performing teams • Understanding team roles • Networking • Mobilizing others • Empathy • Listening skills • Presentation skills	Strategic and analytical thinking • Critical thinking from a sustainability viewpoint • Futures literacy: Anticipating and preparing for future challenges • Transformative agency: Ability to make change, analyzing current states, and pushing for transformation • Systems thinking

with contextual background influences		
Systems thinking • Understanding how different components of a system interact. • Network thinking and making connections • Holistic and multidisciplinary approaches	Adaptability and resilience • Adaptability (e.g., integration of pragmatism in bureaucratic structures) • Coping with uncertainty, ambiguity, and risk • Motivation and perseverance • Knowing how to fail well • Self-awareness and self-efficacy • Positive thinking • Taking initiative	Leadership and advocacy • Ethical leadership: Skills in ethical decision-making, transparency, and fairness • Stakeholder engagement: Ability to engage and communicate with diverse groups (e.g., communities, NGOs, governments) • Political advocacy for sustainable policies and business sustainability practices • Entrepreneurial skills for sustainable innovation
Algorithmic thinking • Designing and applying algorithms systematically • Basic programming skills (e.g., Python, R, Java) • Evaluating and interacting with algorithms	Problem-solving and critical thinking • Critical Thinking • Human-centered design • Problem identification and innovative problem-solving approaches • Prioritization and task management • Resource planning • Ability to combine things together with background influences	Interpersonal and collaborative competences • Collaborative competence (Interpersonal and team collaboration) • Communication and collaboration: Listening skills, presentation skills, fostering interdisciplinary solutions, working with more traditional partners • Empathy: Awareness of societal and environmental challenges, promoting sustainability and adaptability through soft skills
Problem-solving skills • Applying models and systematic approaches to find solutions • Using decomposition and pattern recognition effectively	Communication and stakeholder engagement • Good communication skills • Customer discovery • Stakeholder analysis • Value proposition and proposal validation • Translational skills (e.g., making com-	Personal and self-regulation competences • Intrapersonal competences: Self-supervision for consumer behavior, rational saving, and resource-efficient decisions • Adaptability and perception of pain

	plex concepts understandable)	points in sustainability contexts • Valuing sustainability as a guiding principle in personal and collective actions
Collaborative tools • Hands-on experience with tools like GitHub and Kaggle	Entrepreneurial execution and practical skills • Hands-on skills • Practical connections between theory and practice • Actionable thinking (courage, belief, responsibility) • Guerrilla skills (effectuation and bricolage) • Spotting opportunities and engaging with others	Research and development • Research, Development, and Innovation (R+D+i) for sustainability • Environmental, Social, and Governance (ESG) criteria
Digital competence • Proficiency with digital tools and infrastructure integration • Understanding blockchain and decentralized systems	Technical and financial literacy • Basic knowledge (general understanding across fields) • Financial thinking (budgeting, projections, cash flow management) • Assessing and utilizing technological trends • Technology regulation	Subject knowledge and methods • Juridical knowledge: Understanding the legal aspects related to sustainability • Scenario working, facilitation methods, and collaborative development to integrate ethics and values into the innovation process • Democracy skills: Understanding how individuals and groups can influence sustainability policies and practices
Exploration and discovery • Approaching problems creatively and innovatively • Trying out different solutions	Personal growth and lifelong learning • Inner Development Goals (IDG) • Long-life learning • Learning through experience • Creating value for others ("Product Market Fit") • Demand for quality and efficiency as part of entrepreneurial mindset	
Process knowledge		

• Defining problems and objectives systematically. • Debugging and testing processes		
Accessible and inclusive design • Designing UX with inclusivity in mind		
Agile methodologies • Project management and dynamic service/product design		
Cross-cultural collaboration • Collaborating effectively across diverse cultural and professional backgrounds		
Communication skills • Assertive and effective communication. • Listening, presentation, and collaboration skills. • Social interaction skills		
Ethical awareness in technology • Understanding intellectual property rights and ethical considerations. • Moral reasoning and ethical thinking		
Attitude / mindset • Active, reflective, and critical approach to digital technology. • Courage and human-centric thinking		
Abstract understanding • Understanding information flows and recognizing patterns		

Additionally, some examples of transversal skills and competences adapted to the three pillars:

<u>Lifelong learning and personal development</u>

- Openness to lifelong learning
- Independent learning
- Self-responsibility
- Self-regulation as a basic skill in an ever-changing world
- Self-motivation to learn

- Personal resilience (e.g., dealing with conflicts)
- Self-Knowledge: Awareness of one's own abilities and perspective.
- Flexibility (e.g., adapting to new technologies and experimenting)
- Soft skills: flexibility, resilience, adaptability
- Digital literacy and adaptability in today's job market
- Creative Thinking: Creativity and out-of-the-box thinking

Problem-solving and decision-making

- Understanding and analyzing problems
- Critical thinking (part of 4C Future Skills)
- Making decisions under uncertainty
- Dealing with areas of tension and conflicting goals
- Ability to think in cases and contexts
- Generalization of solutions
- Interpretation and evaluation of data

Interpersonal and social skills

- Teamwork skills
- Social skills (e.g., communication, collaboration)
- 4C Future Skills: creativity, cooperation, communication, and critical thinking
- Digital collaboration
- Finding lines of argument to convince stakeholders (e.g., advocating for resource-efficient processes)

Multidisciplinary and strategic thinking

- Interdisciplinary thinking and acting
- Research and evaluation of sources correctly

Strategies for evaluation and assessing

The assessment strategies combine traditional and innovative approaches, emphasizing real-world applications, process-oriented evaluations, and the integration of soft and technical skills. By aligning with industry needs and leveraging interactive tools, these methods ensure a holistic evaluation of competences across computational thinking, entrepreneurship, and green skills.

Assessment approaches

Before-after comparison

- Self-assessment or external evaluation to measure growth in competences over time.

Project-based assessment

- Participants work on individualized solutions to pre-designed problems and objectives.
- Evaluated against predefined characteristics such as sustainability or affordability.
- Includes real-world applications through case studies and practical challenges.

Problem-based assessment

- Practical problem-solving tasks as part of projects to showcase application of learned competences.

Quizzes and interactive tasks

- Module-based quizzes using single-choice, multiple-choice, and open-ended questions to reinforce learning.

Interactive simulations and games
- Tools like Charles Games, Green New Deal Simulator, or Climate Interactive assess decision-making and knowledge application in simulated environments.

Case studies and practical applications
- Teams address real-world challenges, evaluated on solution quality and applicability.

Situational personal interviews
- Assess soft skills, decision-making under uncertainty, and adaptability.

Process-oriented evaluations
Focus on teamwork, collaboration, and adaptability through:
- Hackathons, role-playing simulations, and interactive games testing group dynamics and problem-solving.

Competence development through experiential learning, such as business model canvases or concept creation.
Teaching methods and learning experiences
Simulation games and interactive tools
- Immersive platforms like Kaggle, Scratch, and Green New Deal Simulator.

Project-based learning
- Practical projects involving concept or campaign development with companies.
- Design Thinking exercises tackling real-world cases.

Living labs and nature-based learning
- Real-world environments to test and evaluate competences in action.

Blended learning
- Combining MOOCs, online tools, and face-to-face workshops to integrate technical and soft skills.

Case Studies and practical scenarios
- Workshops addressing concrete, industry-relevant case studies.

Competence-oriented teaching
- Approaches like PERKA, mentoring, and networking events to foster critical thinking, adaptability, and ethical considerations.

Certification and recognition
Micro-Credentials and Open Badges to digitally certify skill mastery and performance-based competencies.
School and university contexts
School initiatives
- Prepare Computational Thinking (CT) competences in analogue formats before translating to digital spaces.
- Integration of charity projects and entrepreneurial activities into the curriculum.

Higher education
- Compulsory modules combining technical competences with critical judgment and ethical considerations.
- Practical projects involving partnerships with companies and mentoring for career and training guidance.

Tools and platforms

- Utilize existing platforms like Google for Education and AI Campus to integrate curricula.
- Employ hands-on, competence-focused tools such as business model canvases, escape rooms, and mentoring programs.

Challenges in assessment
- Difficulties in effectively assessing soft skills.
- Bureaucratic and funding barriers to implementing competence-based assessments.
- Resistance to change within educational systems.

Proposed solutions
- Develop standardized tools to measure competences.
- Establish feedback loops between educators and industry professionals to refine assessment methods.
- Shift toward practical evaluations such as:
  - Team-based assessments.
  - Case studies.
  - Intrapreneurship projects.

Specific methods
- Self-analysis, self-evaluation, and before-after comparisons.
- Use of real-world scenarios (e.g., business model canvases, value propositions, or circular economy solutions).
- Team-based evaluations to assess collaboration, adaptability, and resilience.
- Completion certificates and microcredentials to validate achievements.

Key competences for evaluation

Entrepreneurial skills
- Negotiation, team management, and project management tools.

Green skills
- ESG criteria, eco-design, and climate change mitigation.

Computational thinking
- Problem-solving, logic, and adaptability to digital tools.

Implementing competences in the curriculum/ training programs and strategies

General strategies for curriculum integration

Flexibility and adaptability
- Adapt curricula to evolving job market demands and diverse learner needs.
- Integrate meaningful tasks aligned with real-world contexts to enhance engagement and relevance.
- Embed modular and adaptable learning pathways (e.g., microcredentials, blended learning).

Project-based learning
- Emphasize hands-on, experiential, and project-based approaches.
- Include charity projects, challenges, and case studies to encourage practical applications.

Collaborations
- Partner with industries, businesses, start-ups, and communities to provide relevant learning opportunities.
- Use mentoring programs (e.g., IHK Berlin) and company-led workshops to align curricula with industry needs.

Interactive and innovative learning methods
- Employ game-based learning, simulation games (e.g., Climate Interactive, En-ROADS), and flipped classrooms.
- Use MOOCs, Barcamps, and other innovative methods for diverse and engaging learning experiences.

Computational Thinking (CT)
Early and progressive learning
- Start with analogue CT competences in school contexts, transitioning to digital skills as students progress.
- Address the heterogeneity in didactic approaches for digital education.

Higher education approaches
- Introduce compulsory modules across degree programs combining liberal arts, critical judgment, technologies, and ethics.
- Foster self-motivation through project-oriented learning on concrete issues.

Digital tools and platforms
- Use tools like Scratch, Blockly, Kaggle, and AI Campus to enhance CT learning.
- Equip teachers with coding skills and adequate resources to deliver CT education effectively.

Teaching and learning innovations
- Encourage problem-solving, independent responsibility, and innovative thinking through coding and computational problem-solving.
- Incorporate activities like Biber and CS unplugged.

Ethical dimensions
- Address topics such as data biases, AI literacy, and ethical considerations in CT.

Green Skills
Alignment with SDGs
- Use the Sustainable Development Goals (SDGs) as a framework for curriculum design.
- Encourage projects aligned with specific SDGs, such as sustainability in agriculture or renewable energy.

Practice-based learning
- Focus on project-, practice-, and experience-based methods to teach green skills.
- Facilitate peer-to-peer learning and community collaborations for practical sustainability education.

University-level integration
- Use lecture series, expert talks, and elective subjects to promote green skills.
- Engage students in practical projects with companies and sustainability campaigns.

Teaching innovations
- Integrate nature-based learning and tools like Sustainicum, Green New Deal Simulator, and sustainability dashboards.

Institutional strategies
- Embed sustainability and ethics across technical and vocational programs.
- Transition educational programs to circular economy models focusing on eco-design and waste management.

Entrepreneurship and innovation
Role models and mentorship
- Invite entrepreneurs to serve as role models and mentors, showcasing real-world applications.

Industry partnerships
- Collaborate with businesses to design projects, case studies, and workshops reflecting entrepreneurial realities.
- Promote initiatives like the WU Changemaker Program.

Practical application
- Include exercises in designing business models, pitching, and starting companies.
- Use challenge-based learning and innovation-based strategies to simulate entrepreneurial environments.

Tools, platforms, and resources
Existing platforms
- Use platforms like Google for Education, KI Campus, Sustainicum, and Climate Interactive to streamline competence delivery.

Innovative materials and guides
- Leverage resources such as the Guidebook SustainabALE, Klimadashboard, and entrepreneurship guides by Johannes Linder.

Community integration
- Collaborate with communities and create protected spaces for hands-on learning and innovation.

Barriers and considerations
Teacher training and support
- Address gaps in teacher capabilities, especially in coding and digital education.
- Provide structured teacher training and standardize concepts for delivering competences.

Assessment and responsibility
- Shift examination culture toward fostering student responsibility and independence.
- Ensure institutions select tools and platforms that meet diverse educational needs.

Needs-oriented approaches
- Design curriculum content that aligns with learners' needs and emphasizes practical, impactful outcomes.

Specific recommendations by competence area
Computational Thinking
- Combine theoretical knowledge with practical skills through layered curricula.
- Use tools like Scratch, Blockly, Kaggle, and Git to enhance CT learning.

Entrepreneurship and Innovation
- Promote challenge-based learning, hackathons, and open innovation sessions.

- Use business model canvases and personal projects to foster entrepreneurial thinking.

Green Skills
- Align projects with SDGs to emphasize sustainability.
- Incorporate community sustainability projects and energy efficiency practices.
- Offer specialized training for public officials on green legislation and impact measurement.

Practice, expectations and requirements

Practical applications of competences
Real-world problem solving:
- Problem-based learning: Students and employees address real-world challenges provided by companies.
- Large, long-running projects where individuals identify problems, form groups, and develop solutions collaboratively.
- Use of design sprints, legal/tech sprints, and digital simulations (e.g., Green New Deal Simulator) to tackle domain-specific issues.

Digital and technological integration:
- AI tools for efficient work (e.g., company-specific chatbots for onboarding and project familiarization).
- Smart devices and digital technologies to track and optimize energy consumption.
- Sharing reusable solutions for office management, such as partial automation of tasks (e.g., file management, booking systems).

Sustainability in practice:
- Bottom-up sustainability initiatives, such as staff-led working groups identifying and addressing environmental challenges.
- Positive incentives for sustainable behaviors (e.g., subsidized public transport tickets, food waste reduction programs, car-sharing apps).
- Schools partnering with local businesses to apply project outcomes in real-world contexts.

Collaborative learning and networking:
- Mentoring, peer groups, and structured networks to transfer competences and build resilience.
- Group activities to strengthen teamwork and self-responsibility (e.g., weekly plans, tasks in teams or individually).
- Competitions and events where dedicated time is provided to work on projects.

Expectations and requirements from companies
Collaboration and engagement:
- Provide real-world cases and problems for learners to address.
- Offer internships, apprenticeships, and industry partnerships to enhance practical learning.

Skill development focus:
- Prioritize transferable skills such as teamwork, independent learning, and adaptability.

- Develop learners' ability to conceptualize and implement projects, including entrepreneurial initiatives.

Flexible learning environments:
- Modular learning pathways, including flipped classrooms and e-learning options, to accommodate varying schedules.
- Tailored content to meet the specific needs of businesses and different learner groups.

Interactive and hands-on approaches:
- Use of case studies, design thinking, and hands-on learning to ensure practical skill application.
- Encouraging employee-led initiatives and innovation through bottom-up processes.

Successful practices and models
Cross-sectoral initiatives:
- Marie Curie Internships: Real-world research opportunities for PhD students to collaborate with industry.
- Quadruple Helix Model: Partnerships between academia, industry, government, and civil society to foster innovation.
- Microsoft AI-Focused Programs: Practical, cutting-edge AI skills training.
- Centers for Research and Development (CRDs): Collaborative projects bridging academic and industry expertise.

Educational institutions:
- Schools leveraging networking and partnerships with local businesses/start-ups.
- University initiatives such as lecture series, expert talks, and interdisciplinary workshops.

Incentive-based learning:
- Rewards for ideas and innovations from employees or students.
- Time allocated during work or school for participation in sustainability projects.

Recommendations for long-term success
Promote flexibility:
- Embed modular, adaptable learning pathways (e.g., micro-credentials, blended learning) to align with evolving skill demands.

Encourage commitment:
- Develop incentives and emphasize mutual benefits to attract active participation from enterprises.

Foster interdisciplinary approaches:
- Design programs that merge academic rigor with practical application for a holistic learning experience.

Leverage proven models:
- Scale successful initiatives (e.g., internships, quadruple helix collaborations) to other sectors and regions.

Real-world applications:
- Promote project-based learning where students work on real-world problems provided by companies.
- Encourage the use of digital tools like AI-based chatbots and smart devices for energy optimization and task automation.

- Leverage bottom-up processes, such as staff-led initiatives, to promote sustainability in organizations.

Industry expectations: align academic training with industry needs by teaching:

- Big data analysis for marketing and decision-making.
- Cross-platform software skills to foster adaptability.
- Holistic service design and user-centric UX approaches.

Collaboration models:

- Use Living Labs and incubators to foster innovation through interdisciplinary partnerships.
- Encourage partnerships between academia, industry, and government (e.g., Quadruple Helix Model).

Challenges, Barriers, and Assessment of Competences and Skills

One of the primary challenges in the development and assessment of competences is bridging the gap between academic programs and the practical needs of the workforce. This disconnect often leaves graduates underprepared for real-world demands. A lack of resources for teaching critical skills such as computational thinking and sustainability further limits the ability of education systems to prepare learners effectively. Additionally, inequitable access to upskilling and professional development opportunities exacerbates inequalities, preventing many individuals from reaching their potential. Bureaucratic hurdles, such as rigid administrative systems, also slow the adoption of competence-based assessment frameworks.

To overcome these barriers, ongoing support for educators and students is essential. Educators require tailored training, particularly in sustainability and multidisciplinary teaching, to ensure they can deliver relevant and impactful education. At the same time, inclusive frameworks must be developed to provide equitable access to learning opportunities for all, particularly underrepresented groups.

Strategically, fostering cross-sector collaboration through models like the Quadruple Helix can align educational objectives with real-world needs by integrating insights from academia, industry, government, and civil society. Mentoring networks and peer support groups are also valuable for helping learners develop both technical and interpersonal skills. Additionally, prioritizing multidisciplinary projects can encourage holistic problem-solving and prepare learners to address complex challenges.

Co-Creation Workshops photos