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Come
ThinkAgain
Certification based Education
Training System

Review of the state of the art & consolidated competences list

EXECUTIVE SUMMARY

This deliverable, part of Task 2.1 of the ERASMUS+ ComeThinkAgain project, reviews leading competence frameworks in the EU and globally. It focuses on integrating **Computational Thinking (CT), Entrepreneurship Education (EE), and Green Skills (GS)** into educational systems to enhance employability, creativity, and career pathways.

Key frameworks like **DigComp, EntreComp, and GreenComp** are analyzed for strengths, gaps, and synergies, exploring how these competences intersect. The report also evaluates integration strategies across various education levels, emphasizing their role in preparing students for a **rapidly evolving job market** driven by digital transformation, sustainability, and innovation.

Lastly, it proposes the ComeThinkAgain competence list—a step toward a global standard that aligns education with market needs and sustainable development goals.

PROJECT OVERVIEW

In today's fast-changing world, future generations must be equipped to navigate challenges like digitalization and climate change. Interdisciplinary, multifaceted competences are essential to tackle the evolving demands of 21st-century professions.

The ComeThinkAgain project addresses this need by **developing a cross-sectoral, standardized training and certification system** built on three interconnected pillars: Computational Thinking, Entrepreneurship Education, and Green Skills. Recognizing the crucial role of educators in shaping the workforce, the project targets teachers in Higher Education and VET trainers.

The project's centerpiece is the ComeThinkAgain CETS (CTA-CETS)— a Micro-Certification Education Training System offering flexible, modular training for both vocational and higher education at the European level, preparing learners for the future job market.

Computational Thinking

Computational Thinking (CT) originated from the pioneering work of **Seymour Papert,** who introduced the term in his influential book Mindstorms: Children, Computers, and Powerful Ideas (1980). Although Papert did not define CT explicitly, he laid the groundwork for **understanding how interactions with computers could transform learning**. His co-development of the LOGO programming language was a practical manifestation of these ideas, offering children a hands-on way to engage with programming concepts. LOGO's simple, interactive design—where a turtle is moved across the screen through programmed commands—helped students visualize the process of creating algorithms and solving problems.

Papert's constructionism theory further emphasized that learning occurs most effectively when individuals **actively construct knowledge by creating meaningful artifacts**. This philosophy inspired later developments like Scratch, a block-based programming tool that simplifies coding while promoting creativity and collaboration (Resnick, 1996).

Evolution of the Concept

CT was later expanded by Jeanette Wing (2006), who defined it as a **way of thinking and problem-solving** fundamental to computer science.

She argued that CT involves conceptualizing problems in ways that **allow solutions to be automated and executed** by information-processing agents. Although her definition sparked widespread interest, it remained abstract, leading researchers such as Cuny, Snyder, and Wing (2010) to refine it: "CT involves the thought processes **required to formulate problems and express their solutions** in ways that can be carried out by an information-processing agent."

Core Elements and Definitions

- **Abstraction:** Identifying patterns and ignoring irrelevant details.
- **Algorithmic Thinking**: Developing step-by-step instructions for solving problems.
- **Decomposition:** Breaking down complex problems into manageable parts.
- **Automation**: Using machines to execute repetitive tasks.
- **Generalization**: Applying learned solutions to new, similar problems.

Emerging Trends

Recent studies have introduced advanced dimensions to CT. Kafai, Proctor, and Lui (2020) propose computational participation, **focusing on collaborative problem-solving and the social aspects of computing**. Similarly, computational empowerment (Dindler et al., 2022) broadens CT's scope by fostering critical reflection on technology's societal impact. These frameworks aim to integrate CT into broader educational goals, promoting not just technical proficiency but also ethical and cultural awareness.

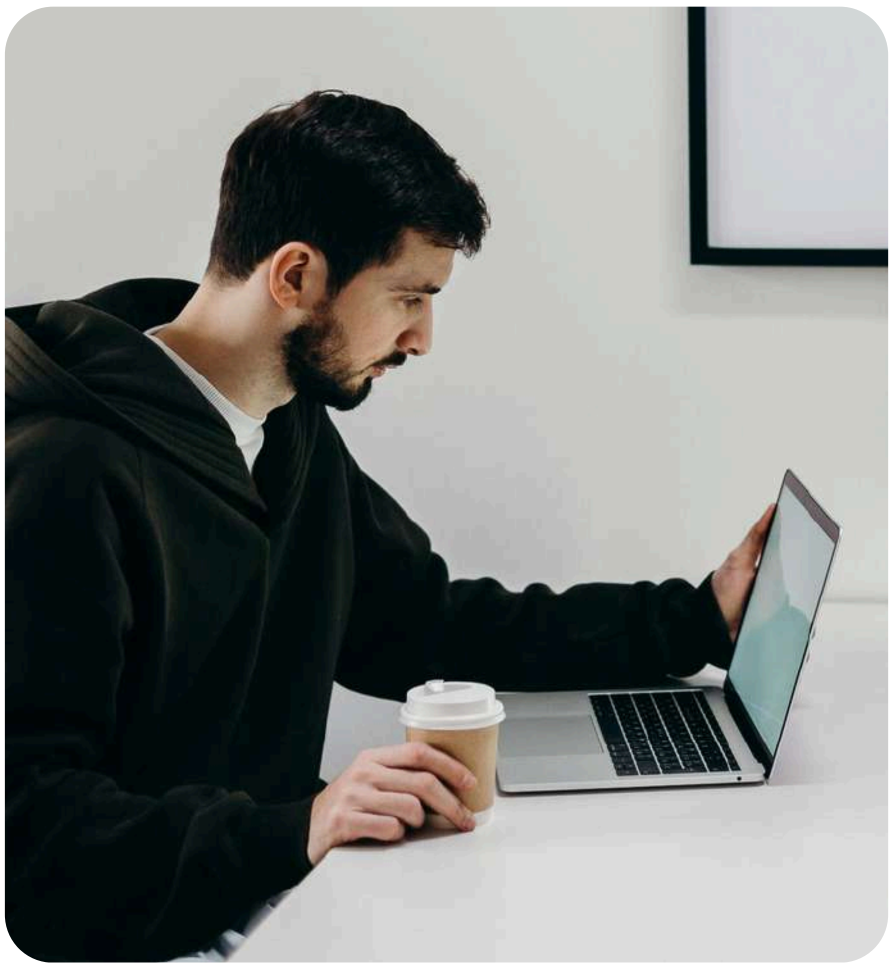
Broader Impact and Challenges

While CT's utility in problem-solving is widely acknowledged, its interdisciplinary application has sparked debate. Proponents argue that CT **equips learners with transferable skills, enabling them to tackle challenges in various domains**, from science and engineering to social sciences and humanities (Shute, Sun, and Asbell-Clarke, 2017). Critics like Denning (2017) caution against overgeneralizing CT as a **universal problem-solving tool**, suggesting that its strengths lie within computer science's confines.

Denning and Tedre (2019) emphasize that CT's effectiveness depends on computational models and algorithms' contextual relevance. For instance, in artificial intelligence, **CT's role extends beyond traditional logic to encompass data preparation, neural networks, and machine learning principles**—an area referred to as CT 2.0 (Tedre, Denning, and Toivonen, 2021).

Digital Competence Framework (DigComp)

What is DigComp? DigComp is a European Union framework designed to enhance digital skills for individuals, guiding education, policy, and workplace training. It identifies five key areas:



1. Information & Data Literacy
Locate, retrieve, and store digital information.
Assess the relevance and purpose of digital resources.

2. Communication & Collaboration
Interact and collaborate using digital tools.
Manage digital identity and participate in online communities.

3. Digital Content Creation
Create and edit digital content responsibly.
Understand copyright and integrate new content into existing knowledge.

4. Security
Protect devices, personal data, and privacy.
Address health and environmental concerns in digital contexts.

5. Problem-Solving
Identify needs and apply digital solutions creatively.
Continuously update digital skills to adapt to new technologies.

Curriculum Integration

Since 2016, efforts have been made to integrate Computational Thinking skills into compulsory education curricula, but **several challenges persist**. These include competition with other subjects, assessment difficulties, and a shortage of qualified teachers. Similar issues **affect initial vocational education and training,** where CT skills are critical for meeting labor market demands but remain underrepresented in curricula. The European Commission's Joint Research Centre (2022) highlights the need for more adequately trained educators in both sectors.

Why It Matters?: DigComp offers a clear progression path from basic to advanced digital competence, shaping future-ready individuals and supporting innovation.

Bringing Computational Thinking to VET

While CT is often associated with primary and secondary education, its integration into vocational education and training (VET) remains underexplored. As industries evolve in the era of Industry 4.0, VET graduates must be equipped with critical thinking and problem-solving skills to meet shifting demands (Kruse et al., 2011; Lee et al., 2014). However, **current VET curricula primarily focus on practical, application-based computer science topics**, such as standardized software and basic cybersecurity, lacking a more interdisciplinary approach.

To bridge this gap, Hermans et al. (2024) **propose a problem-solving framework tailored to VET.** This includes decomposition (**breaking down complex problems**), abstraction (focusing on key details), and algorithmic thinking (developing step-by-step solutions). These elements align well with VET's strength in real-world application, helping students tackle authentic challenges. Effective teaching methods like problem-based, project-based, and design-based learning further enhance CT integration. Other strategies include blended learning and microlearning, which promote adaptability and deeper understanding in manageable steps.

VET & 21st Century Skills

In today's dynamic job market, **VET students need more than technical know-how**—they must master **higher-order thinking and digital literacy**. The "P21 Framework for 21st Century Skills" emphasizes critical thinking, creativity, collaboration, and communication as essential for career readiness (Partnership for 21st Century Skills, 2019). By combining CT with these competences, VET equips students to thrive as innovative, adaptable professionals ready to face complex, real-world challenges.

Entrepreneurship

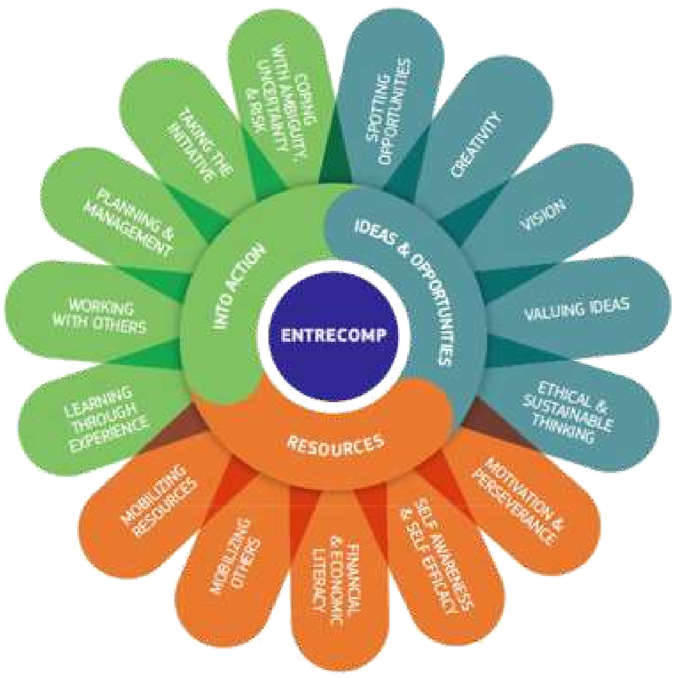
Entrepreneurship is a multifaceted concept, encompassing the ability to **identify opportunities, take risks, and create value** (financial, cultural, or social). It is a critical driver of economic growth, innovation, and societal development. Key frameworks such as EntreComp define entrepreneurship as a competence, organizing it into three areas: **Ideas and Opportunities, Resources, and Into Action** (European Commission. Joint Research Centre. 2016)

Evolution of the Concept

Entrepreneurship has evolved from its roots in economics to a broader application across social and political domains. Early definitions focused on economic outcomes like job creation and productivity gains. Modern perspectives **emphasize innovation, sustainability,** and **the ability to navigate uncertainty**, positioning entrepreneurship as essential for fostering economic resilience and growth.

Core Elements and Definitions

- **Opportunity Recognition:** Identifying and evaluating new opportunities to meet market needs.
- **Risk Management:** Analyzing and minimizing potential risks to navigate uncertainty.
- **Value Creation**: Developing impactful solutions that generate benefits and revenue.
- **Innovation:** Crafting original solutions by connecting ideas creatively.
- **Networking:** Leveraging connections to access resources and expertise.
- **Resilience**: Overcoming challenges and persisting despite setbacks.
- **Confidence**: Believing in one's ability to achieve goals and take initiative.



EntreComp

With the EntreComp Framework, the European Commission provides a definition of entrepreneurship as a competence. The framework divides the competences into three key areas: **Ideas and Opportunities, Resources, and Into Action.** Each area consists of five competences, forming the building blocks of entrepreneurship (European Commission. Joint Research Centre. 2016)

Broader Impact and Challenges

Impact:

- **Economic Growth**: Drives innovation, job creation, and productivity.
- **Social Development:** Encourages sustainable practices and community empowerment.
- **Lifelong Learning:** Enhances adaptability and problem-solving across life stages.

Challenges:

- **Complex Frameworks:** Difficulty in aligning diverse competence models.
- **Assessment Gaps:** Limited standardization for evaluating entrepreneurial skills.
- **Implementation Barriers:** Variability in curriculum integration across regions.

Emerging Trends

Emerging trends in entrepreneurship research highlight evolving focus areas such as **meta-competence frameworks**, clustering skills like **leadership and communication** for integrated development. There is increasing emphasis on sustainability and ethics, encouraging responsible practices in e**ntrepreneurial initiatives.** Additionally, technology-driven entrepreneurship is gaining prominence, leveraging digital tools to **enhance innovation** and **drive progress** (Gianesini et al. 2018)

Existing Training Methods

Entrepreneurship education employs diverse methodologies to equip learners: Project-Based Learning: Real-world entrepreneurial projects to bridge theory and practice. Simulations and Games: Virtual business environments to practice decision-making. Design Thinking: Innovative problem-solving techniques for product and business idea development. Competitions: Platforms for presenting business plans and receiving expert feedback. Guest Lectures and Workshops: Insights from industry professionals. Reflective and Theory-Based Methods: Case studies and theoretical analyses to build foundational knowledge.

Curriculum Integration

The integration of entrepreneurship into education is becoming increasingly important worldwide. Entrepreneurship is seen as a key competence in many countries when it comes to **driving innovation, economic growth and employment.** Educational institutions play a central role, as they prepare young people for the challenges of the global market. Different countries take different approaches to integrating entrepreneurship into their curricula (European Commission. Joint Research Centre. Institute for Prospective Technological Studies. 2015).

The concept of sustainability competences has gained prominence since the 1972 publication of Limits of Growth, which brought global attention to environmental issues and laid the groundwork for integrating sustainability into education. While key sustainability competences were outlined by Wiek, Withycombe, and Redman (2011), there remains no consensus on terminology or frameworks, leading to confusion. Sustainability is broadly defined as the **capacity of societies to maintain viability and integrity over time while respecting planetary boundaries**. Competences in this domain include **knowledge, skills,** and **attitudes** needed to address sustainability challenges and promote sustainable development.

Green skills, distinct from sustainability competences, focus on workforce needs for a green economy and encompass roles that **preserve** or **restore environmental quality**. Education plays a pivotal role in equipping individuals with sustainability competences, as emphasized by the UN's Sustainable Development Goal 4 and the EU's Green Deal. Despite progress in higher education, there is a growing need to prioritize sustainability education in early childhood, primary schools, and adult learning to support global sustainable transformation by 2030 and beyond.

Current Trends and Developments

GreenComp:

GreenComp, the European sustainability framework, outlines **12 competences organized into 4 categories** to promote sustainable living and action across all age groups and education levels.

These categories include: Embodying sustainability values (e.g., valuing sustainability and promoting fairness), Embracing complexity in sustainability (e.g., systems and critical thinking), Envisioning sustainable futures (e.g., adaptability and exploratory thinking), and Acting for sustainability (e.g., political agency and collective action). The framework serves as a guide for integrating sustainability competences into education and training programs.

Key competences for sustainability

The key competences for sustainability, as outlined by Wiek et al. (2011) and refined by subsequent research, emphasize the specialized skills necessary to address sustainability challenges. The foundational framework identifies five core competences:

- **Systems thinking:** understanding complex interrelations
- **Anticipatory competence:** futures thinking
- **Normative competence:** values thinking
- **Strategic competence:** developing solutions
- **Interpersonal competence**: collaboration

Building on this, Brundiers et al. (2021) added implementation competence (applying solutions) and intrapersonal competence (self-reflection and awareness of one's impact). They suggested aligning all competences with sustainability values and emphasized the importance of domain-specific knowledge (e.g., in climate or energy) alongside basic academic skills like critical thinking and professional abilities such as communication and project management.

Redman and Wiek (2021) further expanded the framework by categorizing competences into content-dependent (disciplinary knowledge), general (21st-century skills like critical thinking), and professional (skills for practical applications). Their unified model underscores that all these competences are interconnected and essential for driving sustainable transformation.

Green Skills Frameworks

Sustainability education frameworks emphasize equipping learners with skills for addressing environmental challenges and fostering sustainable behaviors. The Flower Model by Vesterinen and Ratinen (2024), tailored for primary schools, places collaboration at its core, linking other competences—systems thinking, futures thinking, values thinking, and action-oriented skills—through concepts like imagination, empowerment, and dialogue. The model highlights the **role of daily interactions and a connection with nature** in fostering sustainability awareness and behavior in young learners.

The Green Skills Framework by Kwauk and Casey (2022) broadens the scope of sustainability skills beyond STEM fields, promoting inclusivity and integrating three paradigms:

- **Skills for green jobs**: technical and STEM-based
- **Green life skills:** individual sustainable behaviors
- **Skills for green transformation**: addressing systemic issues like inequality

This approach underscores the need for interdisciplinary competences for societal and ecological transformation.

A study by the European Centre for the Development of Vocational Training (2019) examined green jobs and skills across six European countries, revealing diverse interpretations of green skills. **Definitions range from greening traditional roles to fostering new technologies and sustainable practices.** The variability highlights the evolving nature of green skills and the challenges in standardizing frameworks across contexts.

These models collectively emphasize **collaboration, inclusivity,** and **adaptability** as foundational elements for sustainability education and workforce development.

Curriculum Integration

European educational systems are **developing innovative approaches to sustainability education,** focusing on interdisciplinary learning across multiple subjects. The strategy emphasizes a holistic approach that goes beyond traditional **knowledge transfer, integrating cognitive, socio-emotional,** and **behavioral dimensions** of environmental understanding.

Countries are embedding sustainability topics primarily through cross-curricular methods, particularly in sciences, citizenship education, and geography. The goal is to **create a transformative learning experience** that cultivates a proactive, caring mindset towards environmental challenges. By involving entire school ecosystems—from curriculum design to infrastructure—education systems aim to develop students who are not just informed, but **actively engaged in creating sustainable societal change.**

Training Methods

Effective sustainability education relies on diverse, active learning strategies across all educational levels. Key methods include problem-based learning (PBL), project-based learning (PjBL), and service learning (S-L), which foster critical thinking, real-world problem-solving, and social responsibility. Other approaches, such as case studies and simulations, develop complex thinking and teamwork by engaging students in realistic scenarios.

Innovative strategies, including **game-based learning and art-based inquiry, use digital tools and creative activities** to build empathy and environmental awareness. Outdoor education strengthens learners' connection to nature, promoting sustainable values through hands-on experiences. Additionally, blended and digital learning combine online and in-person components, expanding accessibility and offering **interactive, adaptive learning environments.**

In vocational education and training (VET), these methods prepare students for the green transition by integrating sustainability into practical, industry-relevant contexts. Examples include creating **digital solutions for environmental challenges, fostering green entrepreneurship,** and **using gamification to enhance engagement and understanding of sustainable practices.**

Overview of Competence Frameworks Aligned with ComeThinkAgain

DigComp

The Digital Competence Framework for Citizens (DigComp) defines digital competence through five areas: **Information and Data Literacy**, **Communication and Collaboration**, **Digital Content Creation**, **Safety**, and **Problem-Solving**. These areas encompass 21 competences, such as browsing and evaluating digital content, collaborating through digital tools, and ensuring online safety.

EntreComp

The Entrepreneurship Competence Framework (EntreComp) highlights entrepreneurship as a **core competence for lifelong learning.** It structures entrepreneurial skills into three main areas: **Ideas and Opportunities**, **Resources**, and **Into Action**. These areas are further divided into 15 competences, such as creativity, mobilizing resources, and managing uncertainty. EntreComp emphasizes **turning ideas into value, promoting sustainability, and fostering collaboration.**

GreenComp

GreenComp, the European Sustainability Competence Framework, defines 12 sustainability competences across four dimensions: **Embodying Sustainability Values, Embracing Complexity in Sustainability, Envisioning Sustainable Futures,** and **Acting for Sustainability.** Key competences include systems thinking, promoting equity, and fostering political agency for sustainability. The framework aims to equip learners with the skills to navigate complex environmental challenges and drive sustainable change.

COMPETENCE AREA CROSS-ANALYSIS

Computational Thinking

Correlation of CT and DigComp Competences:

The EU's DigComp framework highlights five digital competences: **information and data literacy, communication and collaboration, digital content creation, safety,** and **problem-solving.** The ComeThinkAgain project primarily focuses on the problem-solving competence but broadens its scope to include general thinking skills applicable across disciplines. Key CT skills such as abstraction and pattern recognition align with DigComp's goals of enhancing problem-solving in digital contexts.

CT also intersects with DigComp in areas like data literacy (e.g. structuring and analyzing data) and digital collaboration (e.g. leveraging tools for teamwork and co-creation). However, certain competences like Netiquette or Copyright align less with CT's problem-solving focus. CT prioritizes **programming concepts and innovative problem-solving, whereas safety competences emphasize risk management, creating potential gaps in balancing innovation and safety.**

General Competence List:

- **Data Literacy**: Skills like data analysis and data-driven decision-making.
- **CT Participation:** Collaboration and project-based learning through computational tools.
- **Computing:** Core skills like programming, debugging, and modularization.
- **Higher-Order Problem-Solving:** Tackling complex, multifaceted problems.
- **Algorithmic Thinking**: Creating and optimizing step-by-step solutions.
- **Abstraction, Decomposition, and Pattern Recognition:** Simplifying complexity and identifying trends.
- **System Thinking & Logical Thinking:** Understanding system interactions and decision-making.
- **Simulation, Modelling, and AI Literacy:** Using models to simulate processes and understanding AI.
- **CT Empowerment & Computational Making**: Leveraging tools to innovate and build solutions.
- **Computational Mathematics & Higher-Order Thinking Skills:** Applying mathematical concepts and critical thinking in real-world contexts.

Skill Gaps in Education:

- **Primary/Secondary Education:** Focuses heavily on basic programming, neglecting higher-order CT skills like data analysis and algorithm optimization. Real-world applications are limited, reducing CT's perceived relevance.
- **VET (Vocational Education and Training):** Emphasizes basic digital literacy over advanced computational skills. This leaves students underprepared for emerging fields such as AI, machine learning, and data science.

Challenges in CT Education:

- **Educator Training:** Many teachers lack confidence and adequate training in CT.
- **Technological Infrastructure:** Limited access to digital tools hampers CT instruction, especially in resource-poor regions.
- **Curriculum Inconsistency:** CT integration varies widely across countries, with many failng to embrace its interdisciplinary potential.
- **Misconceptions and Gaps:** A narrow understanding of CT's scope limits its impact on student learning, necessitating better curricula, teacher training, and resource allocation.

Entrepreneurship

Our analysis of entrepreneurship competence frameworks reveals that most frameworks share a **core set of skills related to entrepreneurship.** Given the alignment of the EntreComp framework with the objectives of ComeThinkAgain, we use it as a benchmark for comparison. This exercise does not aim for a precise 1:1 mapping but to assess whether a framework's knowledge areas are generally addressed within EntreComp. Additionally, we identify competence areas from other frameworks not covered by EntreComp. These areas will be reviewed to determine their relevance for inclusion in the ComeThinkAgain competence framework. Key Insights:

- **Widely shared competences:** Opportunity Recognition, Risk Management, Value Creation, Networking, and Resilience.
- **Unique to EntreComp:** Mobilizing Resources, Spotting Opportunities, and Learning Through Experience.
- **Gaps in EntreComp:** Advanced digital entrepreneurship skills, such as leveraging AI and data analytics, entrepreneurial ethics and sustainability, and competences related to scaling ventures in global markets.

Skills Gaps in Education:

Entrepreneurship education has **increasingly emerged as a distinct field within education**. Despite growing recognition, particularly in Europe, significant challenges remain in integrating entrepreneurship into general education. Key issues include a **lack of consensus on curriculum integration,** as well as the **content and methods for delivering entrepreneurial activities**.

Teacher training and qualification further compound the problem. Many educators lack the theoretical understanding, practical experience, and resources necessary to effectively teach entrepreneurship. Consequently, classroom implementation is often hindered. The shortage of ready-to-use examples and best practices exacerbates the difficulty of equipping teachers with the tools to provide impactful entrepreneurial experiences.

Although some progress is being made, there remains a **critical gap** in providing educators with **concrete tools and strategies to engage students** in entrepreneurship meaningfully.

Challenges in Entrepreneurship Education:

- **Infrastructure Deficits**: Many schools lack the physical and technological capabilities to support practical entrepreneurship education.
- **Teaching Materials and Methods:** There is a shortage of tailored tools and materials that align with entrepreneurial learning needs.
- **Business-School Collaboration:** The absence of partnerships limits real-world entrepreneurship experiences for student

Green Skills

Our analysis of sustainability competence frameworks reveals **significant overlap in core areas**, with GreenComp serving as a benchmark for comparison. While not aiming for a precise 1:1 mapping, this approach highlights shared knowledge areas and identifies unique competences in other frameworks for potential inclusion in sustainability education. Key Insights:

- **Widely shared competences:** Valuing Sustainability, Systems Thinking, Futures Literacy, Political Agency, and Collective Action.
- **Unique to GreenComp:** Critical Thinking and Problem Framing.
- **Gaps in GreenComp:** Implementation skills, discipline-specific knowledge, and competences like self-reflectivity and resilience.

Skills Gaps in Education:
- **Curriculum Deficits:** Fossil fuel studies still outweigh renewable energy topics in many universities, delaying green transitions (Vakulchuk & Overland, 2024).
- **Evidence and Research Gaps**
- **Limited focus on sustainability education** across early childhood, vocational, and adult learning levels (European Commission, 2021).
- **Lack of clear criteria** for assessing sustainability competences.

Challenges in Green Skills Education:
- **Educator Barriers:** Insufficient time, skills, and confidence to teach multidisciplinary sustainability topics.
- **Assessment Gaps:** Few established methods to evaluate green skills, limiting feedback and improvement opportunities.

Synergy and Intersection Analysis

Computational Thinking (CT) & Entrepreneurship Education (EE)

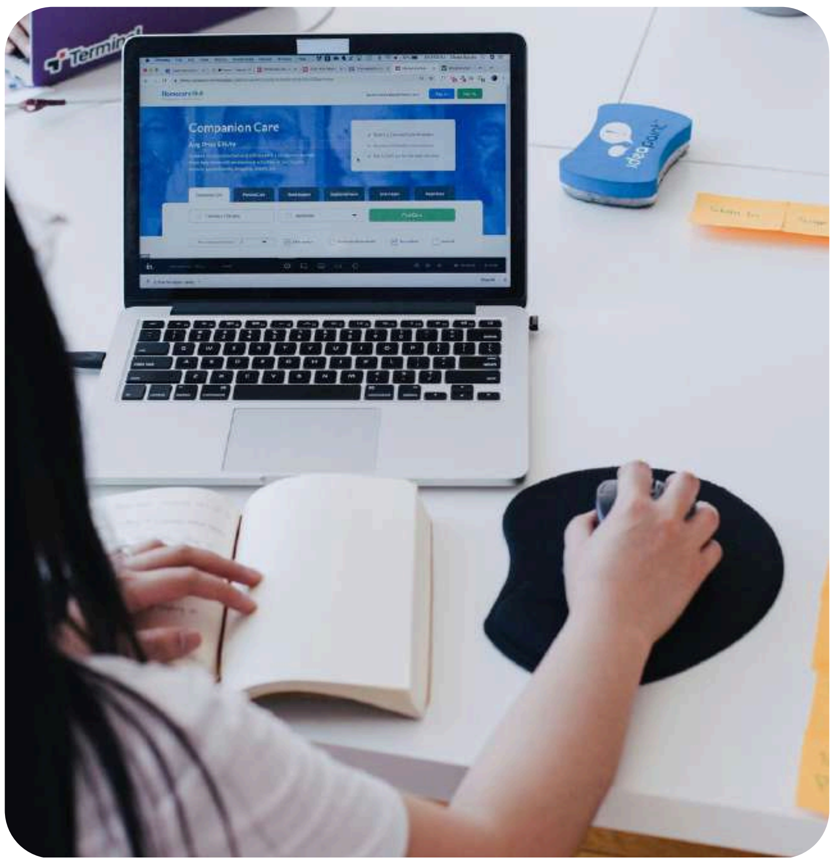
Competences in EE focus on **developing skills for identifying opportunities and transforming ideas** into value-driven actions. These skills, essential for economic growth and innovation, include **initiative, risk management,** and **resource organization**. CT complements EE by offering **structured problem-solving methods** that enhance entrepreneurial decision-making and adaptability.

Key Insights:

- **Complementary Skills:** CT supports breaking down complex challenges, identifying patterns, and making data-driven decisions—core competences for dynamic market environments.
- **Applied Education:** Integrating CT and EE through Maker Education enables students to create products, simulate market scenarios, and develop entrepreneurial thinking.

Recommendations:

- Combine CT and EE in practical projects to simulate real-world entrepreneurial challenges.
- Leverage Maker Education to bridge theoretical and practical competences in schools.



Computational Thinking (CT) & Green Skills (GS)

GS are critical for addressing environmental challenges and fostering sustainable development. They include **systems thinking, futures literacy, and collective action.** CT enhances GS by **providing tools to analyze ecological** data, optimize processes, and innovate eco-friendly practices.

Key Insights:

- **Interdisciplinary Integration:** CT applied in environmental science subjects fosters data analysis and sustainable problem-solving.
- **Innovative Solutions:** Maker projects enable students to design creative, sustainable solutions using CT tools like sensors and Industry 4.0 technologies.

Recommendations:

- Incorporate CT into sustainability-focused curricula to develop actionable problem-solving competences.
- Promote interdisciplinary maker projects for hands-on learning in sustainability.

Entrepreneurship Education (EE) & Green Skills (GS)

The convergence of EE and GS promotes sustainable entrepreneurship (SE)—a **balance between economic, social,** and **ecological goals.** Frameworks like GreenComp and EntreComp illustrate overlapping competences, such as **exploratory thinking and ethical decision-making.**

Key Insights:

- **Aligned Frameworks:** Programs like Green4Future incorporate sustainability into EE, revising EntreComp to include ecological dimensions.
- **Workforce Development:** SE emphasizes readiness for green economic transitions through innovative education approaches.

Recommendations:

- Expand vocational education initiatives to integrate sustainable entrepreneurship concepts.
- Use updated frameworks to design education programs that align with SE goals.

Synergies Between CT, EE & GS

Combining CT, EE, and GS through interdisciplinary projects creates powerful learning experiences. For instance, Maker projects allow students to develop eco-friendly products optimized via CT and marketed through EE strategies.

Key Insights:

- **Holistic Learning:** Projects that merge technology, economics, and environmental concerns foster systems thinking and innovation.
- **Enhanced Problem-Solving:** Students analyze complex sustainability issues and develop entrepreneurial solutions using CT tools.

Recommendations:

- Implement interdisciplinary curricula where students address environmental, technological, and economic challenges.
- Design Maker projects that integrate CT, EE, and GS to promote comprehensive skill development.

ComeThinkAgain Competence List

The ComeThinkAgain Competence List represents the result of an extensive analysis of global and EU-level frameworks, including DigComp, EntreComp, and GreenComp. This comprehensive list integrates key competences in Computational Thinking, Entrepreneurship Education, and Green Skills, addressing the needs of modern education and the evolving job market.

Computational Thinking:

- Algorithmic Thinking
- Decomposition
- Pattern Recognition
- Abstraction
- Modeling and Simulation
- Generalisation
- Logical Thinking
- System Thinking
- Computational Thinking Empowerment
- Computational Thinking Participation
- Higher-Order Thinking Skills
- Higher-Order Problem-Solving
- Digital Literacy
- Data Literacy
- Artificial Intelligence Literacy
- Computational Mathematics
- Computational Making
- Computing (Programming)

Entrepreneurship Education:

- Spotting Opportunities
- Mobilizing Others
- Creativity
- Taking the Initiative
- Vision
- Planning and Management
- Valuing Ideas
- Coping with Uncertainty, Ambiguity, and Risk
- Working with Others
- Self-Awareness and Self-Efficacy
- Learning Through Experience
- Motivation and Perseverance
- Guerrilla Skills
- Mobilizing Resources
- Demand for Quality and Efficiency
- Financial and Economic Literacy
- Ethical and Sustainable Thinking

Green Skills:

- Systems Thinking
- Critical Thinking
- Problem-Solving
- Futures Literacy
- Valuing Sustainability
- Political Agency
- Collective Action
- Supporting Fairness
- Promoting Nature
- Adaptability
- Exploratory Thinking
- Individual Initiative
- Interpersonal and Collaborative Competence
- Intrapersonal Competence

Framework Flexibility and Adaptability

The competences in the list are not hierarchically organized, allowing for adaptation to diverse educational contexts, levels, and regional needs. **This flexibility ensures relevance across various target groups**, from primary to higher education.

In the ComeThinkAgain project, this list forms the foundation for developing educational content and tools. Its iterative design will undergo continuous refinement to reflect the latest educational and industry trends, ensuring relevance and high-quality outcomes.

Vision for the Future

By integrating Computational Thinking, Entrepreneurship Education, and Green Skills, this competence list aims to cultivate a well-rounded skill set for learners. The goal is to prepare individuals for successful careers and meaningful societal contributions in a world increasingly driven by technology and sustainability. Through its dynamic approach, the framework empowers educators and institutions to foster innovation, sustainability, and entrepreneurship.

Final notes

This document is a summary of the full deliverable *"Review of the state of the art & consolidated competences list"*. The full report is available on the ComeThinkAgain website in the resources section.

Report title: "Review of the state of the art & consolidated competences list"
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About this report