

**Training Material: Creative Thinking Learning Lab** 

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### Introduction

Welcome to the learning material for the Creative Thinking Learning Lab (CTLL) training program. This material is designed to guide you through essential concepts and methods for fostering creativity and sustainable development in within the 21<sup>st</sup> Century TVET Rwanda project. It is divided into three main sections: **Creativity, CTLL,** and **Sustainable Development**.

The **Creativity** section covers why creativity matters and provides definitions of creativity and creative thinking. The **CTLL** section introduces Consufé's innovative Lab, including a detailed definition, the Lab's steps, core elements, and the theories supporting it. Finally, the **Sustainable Development** section covers key concepts of sustainable development and includes an overview of the GreenComp framework, which is an EU framework that highlights the competencies necessary for building a sustainable future.

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# **Creativity**





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#### The importance of creativity

The different agencies have classified the required skills in different categories. In general, we can classify those skills into three categories 1) innately human skills such as creativity, empathy, problem solving are referred as soft skills, 2) disciplinary skills, related to specific fields of knowledge, and the 3) digital skills, which are related to the use of technology. Digital skills are identified as indispensable at all the levels of the organizations, however, contrary to the expected, digital skills are not the most relevant skills for the current and future workforce, but the soft skills. LinkedIn, the World Economic Forum, the OECD, and the McKinsey Institute have stated that soft skills are what makes possible to reach the full potential of digital technologies; creativity being the top skill that workers will need.

The figure below, from the *Future of Jobs Report 2023*, lists the top 10 skills for the future of work, with creativity ranked as the second most important (World Economic Forum, 2023).



#### Definition of critical thinking and creativity

In the following page there is an extracts of the report: *Fostering Students' Creativity and Critical Thinking* (Vincent-Lancrin et al., 2019):

Creativity and critical thinking are distinct but closely connected cognitive skills that require high levels of mental energy and focus. Both involve complex thought processes, but their objectives differ. Creativity focuses on generating new, appropriate





ideas and outcomes, while critical thinking involves analyzing and assessing ideas and theories to determine the best, most independent conclusions, potentially guiding action. (Vincent-Lancrin et al., 2019, p. 23)

Research on creativity has examined the mental processes involved: divergent thinking, which involves generating a variety of ideas, and convergent thinking, which focuses on selecting and refining a strong idea. In the creative process there are four components: fluency (the ability to produce many relevant ideas), flexibility (the capacity to think of various types of ideas), originality (the generation of unique ideas), and elaboration (the skill to expand on ideas in detail). (Vincent-Lancrin et al., 2019, p. 24)

Direct quotes from (Vincent-Lancrin et al., 2019, pp. 24–24) indicates:

Critical thinking can be a step in the creative process or not: convergent thinking does not necessarily have to adopt a "critical" stance. Critical thinking mainly aims at assessing the strength and appropriateness of a statement, theory or idea through a questioning and perspective-taking process – which may in turn result (or not) in a possibly novel statement or theory. Critical thinking need not lead to an original position to a problem: the most conventional one may be the most appropriate. However, it typically involves the examination and evaluation of different possible positions.

Many of the cognitive processes involved in creativity and critical thinking share commonalities. Both require prior knowledge in the domain of application. The sub-skills that need to be deployed for each competence involve imagining, inquiring, doing and reflecting. Creativity puts more emphasis on imagining (brainstorming, generating ideas and alternatives), while critical thinking puts more emphasis on "inquiring", including its more analytical and systematic dimension (understanding and decomposing the problem, etc.). Critical thinking is mainly inquisitive, a detective way of thinking; creative thinking is imaginative, the artist way of thinking. However, critical thinking involves imagining alternative theories, counterfactuals, reasons and results in an action (making a judgment); creativity requires making judgments and decisions about the alternative ideas generated in the imaginative process, and more fundamentally to examine the assumptions of existing solutions and conventions before action (creating something novel and appropriate).





Both creativity and critical thinking require a certain level of openness and curiosity. Both may lead to challenging authority, values or accepted norms, and this is what may make them both valuable and sometimes challenging. Critical thinking requires scientific integrity; creativity requires discipline and judgment. When education is conceived as the mere transmission of socially accepted knowledge, there is little room for creativity and critical thinking. On the other hand, like most other skills, creativity and critical thinking only have to be exercised at some points: even if this were concretely possible, a world in which people were all the time creative or all the time critical would be very hard to live in. Chances for cumulative knowledge and learning would become scarce, and the lack of accepted conventions would make life in society difficult. Students also need to learn when and about what they can or should think creatively or critically.

Even though one can describe them at the conceptual level in a domain-general way, both creativity and critical thinking are mainly domain-specific in practice: they require knowledge about a field or context to be practiced, and usually being very creative or a strong critical thinker in one domain does not imply any transfer of those skills to another domain. They may also involve

In the same report they decompose the creation process in four categories: inquiring, imagining, doing and reflecting (Vincent-Lancrin et al., 2019, pp. 56–57).

**Inquiring**: Creativity involves identifying problems and gathering knowledge to understand different perspectives. This process varies based on the situation, from empathizing with others to objectively analyzing issues, with curiosity and unconventional connections playing a key role.

**Imagining**: Imagination allows people to explore and invent new ideas, scenarios, and solutions. It involves freely generating and associating ideas, even unconventional or seemingly absurd ones.

**Doing**: Creativity culminates in creating something novel and relevant, selecting ideas, and refining them through trial and error.

**Reflecting**: Reflection and intentionality guide creativity, distinguishing it from random novelty. This reflection occurs at various stages, influencing which ideas to pursue and develop

Some **personal attitudes or dispositions of creativity** are (from the report citing Csikszentmihalyi, 1991): physical energetic, smart and naive, playful and responsible, full of imagination and fantasy but rooted in reality, both introvert and extrovert, humble and proud, more sensitive and less gender-stereotyped, both passionate and objective about their work.





The report provides examples of what is and what is not creative thinking and critical thinking:

Category	Examples of Actions	Non-Examples
Creative Actions	Proposing something significantly different from existing solutions Proposing something different from one's previous work Finding an unusual solution to a problem	Reproducing something already done Solving a complex problem in a typical way Producing something novel but inappropriate or only personally novel
Critical Thinking Actions	Questioning and evaluating ideas before forming an opinion Considering multiple alternatives before deciding Examining arguments thoroughly Suspending judgment until sufficient inquiry Overcoming confirmation bias Accepting uncertainty and indecision when evidence is lacking	Solving a well-defined problem without critical analysis Accepting the first idea that comes to mind Blindly repeating established ideas or cultural beliefs Rejecting conclusions solely due to minor uncertainties or popularity of the view

The report includes rubrics that help clarify and compare creativity and critical thinking. These rubrics, located on the next page, serve as useful tools for both designing learning activities and assessing our own and students' creative and critical thinking skills.





	<b>CREATIVITY</b> Coming up with new ideas and solutions	CRITICAL THINKING Questioning and evaluating ideas and solutions
INQUIRING	<ul> <li>Feel, empathise, observe, describe relevant experience, knowledge and information</li> <li>Make connections to other concepts and ideas, integrate other disciplinary perspectives</li> </ul>	<ul> <li>Understand context/frame and boundaries of the problem</li> <li>Identify and question assumptions, check accuracy of facts and interpretations, analyse gaps in knowledge</li> </ul>
IMAGINING	<ul> <li>Explore, seek and generate ideas</li> <li>Stretch and play with unusual, risky or radical ideas</li> </ul>	<ul> <li>Identify and review alternative theories and opinions and compare or imagine different perspectives on the problem</li> <li>Identify strengths and weaknesses of evidence, arguments, claims and beliefs</li> </ul>
DOING	<ul> <li>Produce, perform, envision, prototype a product, a solution or a performance in a personally novel way</li> </ul>	<ul> <li>Justify a solution or reasoning on logical, ethical or aesthetic criteria/reasoning</li> </ul>
REFLECTING	<ul> <li>Reflect and assess the novelty of the chosen solution and of its possible consequences</li> <li>Reflect and assess the relevance of the chosen solution and of its possible consequences</li> </ul>	<ul> <li>Evaluate and acknowledge the uncertainty or limits of the endorsed solution or position</li> <li>Reflect on the possible bias of one's own perspective compared to other perspectives</li> </ul>

# Table 1.1. OECD rubric on creativity and critical thinking (domain-general, comprehensive)

Note: This rubric is meant for teachers/faculty to identify the student skills related to creativity and to critical thinking that they have to foster in their teaching and learning, not for assessment.

#### Table 1.2. OECD rubric on creativity and critical thinking (domain-general, class-friendly)

	CREATIVITY Coming up with new ideas and solutions	CRITICAL THINKING Questioning and evaluating ideas and solutions
INQUIRING	Make connections to other concepts and knowledge from the same or from other disciplines	Identify and question assumptions and generally accepted ideas or practices
IMAGINING	Generate and play with unusual and radical ideas	Consider several perspectives on a problem based on different assumptions
DOING	Produce, perform or envision a meaningful output that is personally novel	Explain both strengths and limitations of a product, a solution or a theory justified on logical, ethical or aesthetic criteria
REFLECTING	Reflect on the novelty of the solution and of its possible consequences	Reflect on the chosen solution/position relative to possible alternatives

Note: This rubric is meant for teachers/faculty to identify the student skills related to creativity and to critical thinking that they have to foster in their teaching and learning, not for assessment.





#### Pedagogies to critical thinking and creativity

Teaching creative and critical thinking benefits from diverse, hands-on pedagogies that encourage exploration and problem-solving. For example, **Project-based learning** immerses students in real-world challenges, allowing them to apply creative solutions throughout a project's lifecycle. **Research-based learning** encourages inquiry and exploration, fostering creativity by engaging students in the process of discovering new knowledge. **Dialogical teaching** uses open discussions to prompt students to think critically and express novel ideas. **Design thinking** guides students through empathy, ideation, and prototyping, teaching them to create feasible solutions. **Innovation labs** provide flexible, collaborative spaces where students experiment and refine ideas, supporting a creative, iterative learning process. These methods nurture creativity by placing students in active, reflective, and collaborative roles (Vincent-Lancrin et al., 2019, pp. 100–117).





## **Consufé's The Creative Thinking Learning Lab**







### The CTLL

Based on theoretical informed and empirical-tested concepts, such as play theory, visual thinking, collaboration, knowledge creation, metaphorical thinking, imagination, design thinking, storytelling, the Lab proposes to create a temporary creative thinking space (within existing infrastructures), where participants explore new ways of learning, interacting and creating knowledge for problem solving. The aim of the Lab is to accelerate the development of creativity by engaging people with disruptive approaches to solve problems and co-create solutions.

The hypothesis behind the Lab is that if we immerse people, for a short time, into a space that shape a mindset of collaboration, playing, prototyping, innovation, learning, creativity, curiosity and wonder, they will be more like to try new ways of working together. The Lab does not aim to change participants' life, but disrupt their way of thinking and interacting, which may start the process of develop the creativity skill on the participants.

#### Components of the Lab

The CTLL integrates tools, space, and process to foster creativity. Each element complements the others, working together to support idea generation, exploration, and innovation.

- Space: The layout of the Lab is intentionally designed to support each stage of the creative process. Specific zones and furniture create the right environment for various activities, such as information gathering, ideation, and prototyping. This spatial structure encourages focus and experimentation in a safe, flexible atmosphere.
- 2. **Tools**: Carefully chosen tools enhance both the process and the space. They provide tangible resources for participants to visualize, prototype, and iterate on ideas, making abstract concepts tangible, accessible and manipulable.
- 3. **Process**: The structured, iterative process guides participants through phases of creative process. Tools and space continually support this journey, ensuring each step is supported to achieve the kind of thinking and interaction desired.

Together, these components create a cohesive ecosystem where creative thinking can thrive, encouraging risk-taking, run for mistake, experimentation, play, collaboration, learning and reflection.





#### Key concepts behind the Lab

**Serious Play**: Research shows that play can be a powerful tool for learning at any age. In the Lab, participants engage in activities like storytelling, role-playing, modelbuilding, drawing, and games. These structured activities create a safe, experimental space where participants can test solutions and see familiar challenges from new perspectives. While similar to simple play, Lab activities have defined roles, rules, and a clear purpose. Unlike regular play, however, serious play goes beyond enjoyment; it encourages participants to actively reflect on their actions and connect them to learning (Hinthorne & Schneider, 2012).

**Visual Thinking**: Visual thinking is about moving beyond words to express ideas. Instead of only using writing or speaking, participants in the Lab are encouraged to represent their thoughts with diagrams, drawings, pictures, or 3D models. This approach allows abstract concepts, feelings, or ideas to take a physical form, making them easier to see, understand, and work with. By externalizing thoughts in this way, visual thinking makes abstract ideas more concrete, creating opportunities for participants to share and build on each other's ideas collaboratively. (Kirsh, 2009, 2017; Roos, 2006).

**Collaboration:** The Lab activities incorporate both individual and group work, though the primary approach emphasizes collaborative problem-solving. The focus is on working together to accomplish a shared task. Roschelle and Teasley (1995, p. 70) differentiate between cooperative work, where a task is divided among participants so that "each person is responsible for a portion of the problem-solving," and collaborative work, which they define as "the mutual engagement of participants in a coordinated effort to solve the problem together."

**Metaphorical Thinking:** The Lab encourages the use of metaphors as a tool for generating new perspectives and understanding. By applying knowledge from one context to another, participants can create new ideas and solve problems. Metaphors allow us to transfer knowledge from one familiar context to a new or complex situation, making it easier to understand abstract concepts or challenging issues. By saying, "It's like..." or using analogies, participants can explore new ideas, simplify complex problems, and communicate insights in more relatable vocabulary. (Gibbs, 2008; Lakoff & Johnson, 1980).

#### **Creative skills**

In the Lab, we emphasize seven key creative thinking skills, selected from a wider set to foster targeted growth in creativity. These skills are visually represented in a spider web figure, illustrating their interconnected nature and guiding participants through each skill area







#### The process

Our process, illustrated in the following figure, shares similarities with other creative thinking models, in fact the process is based on the Double Dimond of Innovation model, but has two specific emphases. We prioritize *immersion*, ensuring participants are mentally prepared to enter in the creative thinking process. The process culminates in *reflection*, reinforcing our Lab's primary goal: fostering learning and skill development rather than focusing solely on the effectiveness of generated solutions. This approach ensures that participants not only create but also grow in their creative thinking abilities, which is central to our Lab's educational focus.





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### Tools

In the Lab, we employ a range of tools, though we only highlight a few here. Many other free toolkits are accessible online, offering flexibility for different needs. The essential skill is understanding *how* and *when* to use each tool, as there are no fixed tools assigned to specific steps in the process. Many tools are versatile, fitting multiple stages depending on intent. When planning the Lab for this project, we selected tools that best support teachers in experiencing the Lab and applying it as a teaching method.

- 1. **Idea Prioritizing**: Helps focus on the most valuable ideas, enhancing decisionmaking.
- 2. **6 Thinking Hats**: Encourages diverse perspectives and structured thinking, promoting deeper discussions.
- 3. **Brainstorming**: A classic tool for generating ideas and encouraging free thinking.
- 4. **Drawing Brainstorming (e.g., Crazy 8)**: Engages participants visually to generate ideas, breaking the traditional way of thinking
- 5. **Imagining the Future**: Fosters visionary thinking and helps participants consider long-term implications.
- 6. **Reflection Where I want to be in xxx years**: Encourages personal goal setting and self-assessment, vital for growth and motivation.
- 7. **Storytelling with Cubes**: A fun way to encourage creativity and narrative thinking
- 8. **Philosophical Cube**: Promotes critical thinking, collaboration and open mind to understand a problem.
- 9. **Draw a Beach Exercise**: Encourages reflection about how others translate our description to their own knowledge and context.
- 10. **Behaviour Exercise do more of this and less of that**: Assists in self-reflection and planning how to achieve goals.
- 11. **Field Work**: Provides real-world context, grounding creative ideas in practical experience.
- 12. **Observation**: Develops attention to detail and understanding of context, which can inspire innovative ideas.
- 13. **Interview**: Gathers diverse insights, enriching the creative process with varied perspectives.



- 14. **Question Your Assumptions**: Challenges existing beliefs, promoting openness and innovative thinking.
- 15. **Mind Maps**: Visualizes connections between ideas, aiding in organizing thoughts and sparking new insights.
- 16. **Giving and Receiving Feedback**: Enhances collaboration and helps refine ideas, leading to better outcomes.
- 17. **Map the System**: Helps participants understand complex relationships, enabling more informed decisions.
- 18. **Asking Questions**: Encourages to ask questions that help to get deeper knowledge, empathy and understanding, instead of judgment.
- 19. **Prototyping**: Allows for tangible exploration of ideas, facilitating testing and iteration.
- 20. **The Newspaper Exercise**: Engages participants in real-world issues, encouraging them to think critically and creatively about solutions





# **Sustainable Development**







#### **Main Concepts**

Exact citations:

From ((Bianchi et al., 2022)

"**Sustainability** means prioritising the needs or all life forms and of the planet by ensuring that human activity does not exceed planetary boundaries". Page 12.

A **sustainability competence** empowers learners to embody sustainability values, and embrace complex systems, in order to take or request action that restores and maintains ecosystem health and enhances justice, generating visions for sustainable futures. GreenCom.

This definition focuses on developing sustainability knowledge, skills and attitudes for learners so they can think, plan and act with sustainability in mind, to live in tune with the planet. Page 12.

**Learning for environmental sustainability** aims to nurture a sustainability mindset from childhood to adulthood with the understanding that humans are part of and depend on nature. Learners are equipped with knowledge, skills and attitudes that help them become agents of change and contribute individually and collectively to shaping futures within planetary boundaries. Page 12.

#### From (International Labour Office, 2022)

"**GREENING** - The process of pursuing knowledge and practices with the intention of becoming more environmentally friendly, enhancing decision-making and lifestyle in more ecologically responsible manner, that can lead to environmental protection and sustainability of natural resources for current and future generations". Page XI

"GREEN JOBS - Jobs that contribute to preserving or restoring environmental quality, while also meeting longstanding demands and goals of the labour movement, such as adequate wages, safe working conditions and workers' rights (UNEP et al., 2008)." Page XI

"GREEN SKILLS The knowledge, abilities, values and attitudes needed to live in, develop and support a sustainable and resource-efficient society (CEDEFOP, 2012)." Page XI

**Green Campus** A place where environmentally responsible practice and education go hand in hand and where environmentally responsible tenets are borne out by example. (GREENING THE CAMPUS A step-by-step guidebook for Schools, report).

From (UNESCO, 2024, pp. 26-49)



#### Three critical questions

Youth demands can be summarized through answers to three critical questions:

- a) What should we learn to get climate-ready?
- b) How should we learn to get climate-ready?
- c) Where should we learn to get climate-ready?



#### ${ig I}$ Box 4. Definitions of learning domains in Education for Sustainable Development

**Cognitive**: To acquire knowledge and understanding, and to practice critical thinking about global, regional, national, and local issues; the interconnectedness and interdependence of different countries and populations; as well as the social, economic, and environmental aspects of sustainable development.

**Social and emotional:** To have a sense of belonging to a common humanity and of concern for the natural environment; sharing values and responsibilities beyond borders; having empathy, solidarity and respect for differences and diversity; as well as feeling, reflecting, and assuming a sense of intergenerational responsibility for the present and future.

**Behavioural:** To act effectively, creatively, and responsibly at local, national and global levels to promote a more peaceful, inclusive, green and sustainable world. This domain nurtures the ability of learners to act in responsible, compassionate, respectful and non-violent ways, building constructive and sustainable relationships. It also refers to action competencies, such as participating constructively in community (local or global) projects that promote sustainable development in one's immediate environment and beyond. Finally, the behavioural dimension helps learners apply their learnings according to local community norms or broader societal standards.

Source: Adapted from UNESCO, 2015, p.15. Available under CC BY-SA 3.0 IGO





#### How should we learn?

This is a summary generated with ChatGPT using the original text (UNESCO, 2024, pp. 29–31) present core teaching approaches for engaging students in environmental and sustainability education:

- 1. **Learner-Centered Learning**: Encourages student autonomy and involvement in their own learning.
- 2. Active and Experiential Learning: Focuses on hands-on activities and reflections that connect knowledge to action.
- 3. **Critical Pedagogy**: Promotes critical thinking and social justice by examining societal norms and fostering transformative learning.
- 4. **Problem-Based Learning**: Organizes learning around real-world problems to stimulate inquiry and project-based work.
- 5. **Collaborative Learning**: Emphasizes teamwork and community involvement in finding solutions.
- 6. **Media and Technology**: Uses visual tools, social media, and XR technologies to increase engagement with climate issues.
- 7. **Diversity and Intersectionality**: Ensures curriculum inclusivity, recognizing diverse student backgrounds and promoting climate justice.

These methods aim to make learning dynamic, relevant, and inclusive, aligning education with sustainability goals





#### Summary of the GreenComp Framework

The following text and figure are a direct quote from the Green Comp framework (Bianchi et al., 2022)

## 3.1 Visualisation

Figure 3 provides a visual representation of *GreenComp*. It builds on bee pollination as a metaphor for the framework where bees, flowers, nectar and beehives represent the four areas of the framework. As a simile of a highly-developed natural system, the metaphor highlights the interplay and dynamics between the four areas and 12 competences of *GreenComp*.

**Bees** represent the competences related to the area 'acting for sustainability': political agency, collective action, and individual initiative. Bees act as both individuals and a collective organism. Each bee plays a vital role to ensure that the colony functions while they all work together to achieve the same goal.

**Flowers** represent the competences related to the area 'envisioning sustainable futures': futures literacy, adaptability, and exploratory thinking. Flowers

generate fruits and fruits generate seeds so life can continue.

The **beehive** represents the competences related to the area 'embodying sustainability values': valuing sustainability, supporting fairness, and promoting nature. The beehive protects and sustains the bees.

**Pollen** and **nectar** represent the competences related to the area 'embracing complexity in sustainability': systems thinking, critical thinking, and problem framing. Pollen and nectar attract bees to flowers, and bees transport the pollen from flower to flower while harvesting food for their colony. The interdependencies between pollen, bees and flowers ensure the survival of both plants and bees.







#### GreenComp consists of 12 competences organised into the four areas below:

**Embodying sustainability values** - encourages us to reflect on and challenge our own personal values and world-views in terms of unsustainability, and sustainability values and world-views. This area advocates equity and justice for current and future generations, while supporting the view that humans are a part of nature. Including the competences:

- Valuing sustainability: To reflect on personal values; identify and explain how values vary among people and over time, while critically evaluating how they align with sustainability values.
- **Supporting fairness:** To support equity and justice for current and future generations and learn from previous generations for sustainability.
- **Promoting nature:** To acknowledge that humans are part of nature; and to respect the needs and rights of other species and of nature itself in order to restore and regenerate healthy and resilient ecosystems.

**Embracing complexity in sustainability** is about a) empowering learners with systemic and critical thinking, and encouraging them to reflect on how to better assess information and challenge unsustainability, b) scanning systems by identifying interconnections and feedback; and c) framing challenges as sustainability problems which helps us learn about the scale of a situation while identifying everyone involved. Including the competences:

- **Systems thinking:** To approach a sustainability problem from all sides; to consider time, space and context in order to understand how elements interact within and between systems.
- **Critical thinking:** To assess information and arguments, identify assumptions, challenge the status quo, and reflect on how personal, social and cultural backgrounds influence thinking and conclusions.
- **Problem framing:** To formulate current or potential challenges as a sustainability problem in terms of difficulty, people involved, time and geographical scope, in order to identify suitable approaches to anticipating and preventing problems, and to mitigating and adapting to already existing problems.

**Envisioning sustainable futures** enables learners to visualise alternative future scenarios and identify actions to achieve a sustainable future. It is essential that learners acquire the competence of 'adaptability' while coping with uncertainty about the futures and trade-offs in sustainability. Applying creative and transdisciplinary approaches to our way of thinking can foster a circular society and encourage learners to use their imagination when thinking about the future. Including the competences:





- **Futures literacy:** To envision alternative sustainable futures by imagining and developing alternative scenarios and identifying the steps needed to achieve a preferred sustainable future
- **Adaptability:** To manage transitions and challenges in complex sustainability situations and make decisions related to the future in the face of uncertainty, ambiguity and risk
- **Exploratory thinking:** To adopt a relational way of thinking by exploring and linking different disciplines, using creativity and experimentation with novel ideas or methods

Acting for sustainability encourages learners to take action at individual and collective level to shape sustainable futures, to the extent possible. It also invites learners to demand action from those responsible to make change happen. Including the competences:

- **Political agency:** To navigate the political system, identify political responsibility and accountability for unsustainable behaviour, and demand effective policies for sustainability
- Collective action: To act for change in collaboration with others
- **Individual initiative:** To identify own potential for sustainability and to actively contribute to improving prospects for the community and the planet

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