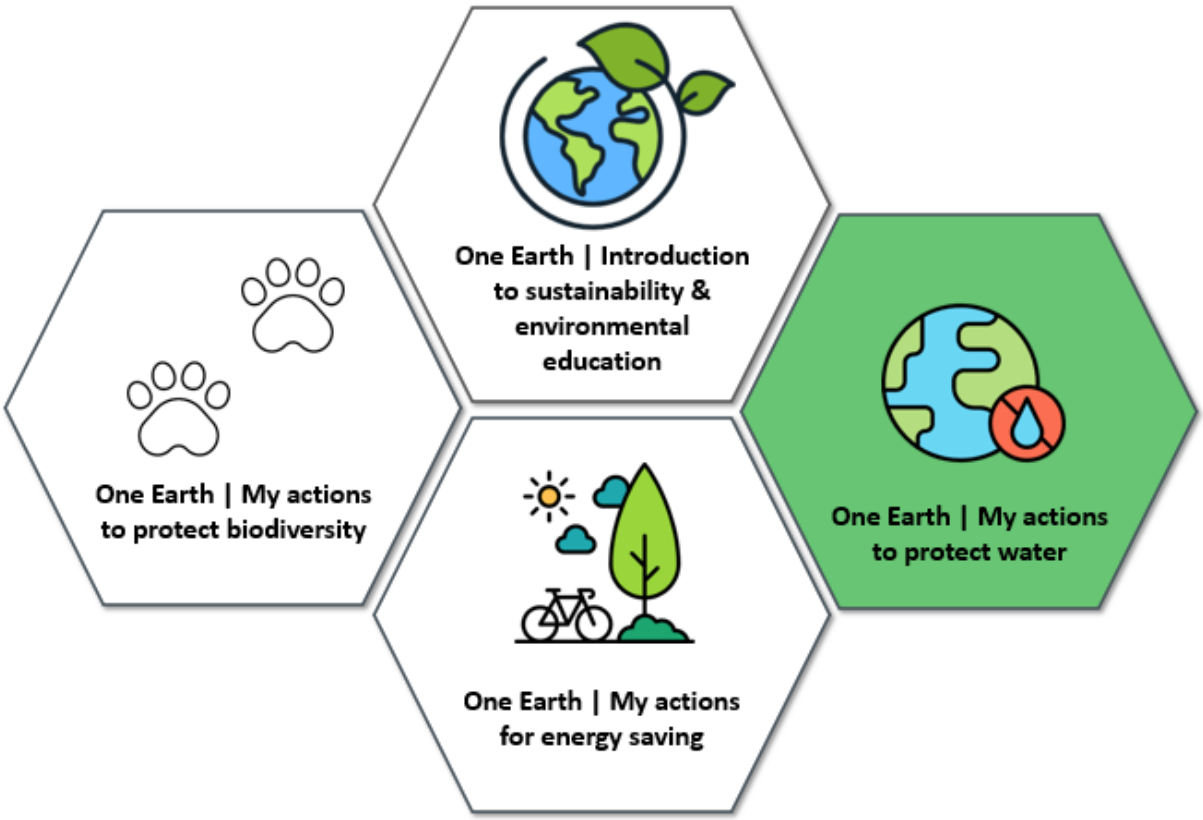
Teacher Academy Project
TEACHING SUSTAINABILITY



SUSTAINABILITY AND ENVIRONMENTAL EDUCATION

Learning and Teaching Package 3

UNIT 3. ONE EARTH: MY ACTIONS TO PROTECT WATER

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Overview

The LTP approaches sustainability and environmental education and is organized in four units, based on a common theme: 'One Earth.' Each unit aligns with one of the Sustainable Development Goals (SDGs). In each unit different educational resources and pedagogical approaches are employed to foster primary school students' knowledge and the essential competencies related to sustainability. The aim is to enable them to take actions to protect biodiversity, promote the responsible use of water, encourage sustainable consumption and save energy.

Unit 3 presents pedagogical resources about water, water protection and water saving, to be used in primary school. The quality of water is a major environmental issue, as stated by the United Nation on SDG 6, whose focus is to ensure availability and sustainable management of water and sanitation for all. This unit also invites to discuss and reflect on practices which aim is to develop the primary school students' understanding about water being part of complex global interrelationships and systems. Different situations to stimulate the primary school reasoning about the Earth' water amount, how water is distributed and how water is used in different cultural contexts are going to be presented. Reflect on probable causes, effects and consequences of water pollution and water scarcity in their close environment is a focus of this unit. Individual and collective action to protect water quality and reduce its waste will be another focus of this unit.

The materials aim to give ideas to bring them into teacher education and schools and can be adapted for various contexts and enriched further. The Unit finishes with a Follow-Up Activity for teachers to reflect on their practice in view of integrating the topic of sustainability into their practice, and includes TAP-TS Roadmap that can be seen as a visualisation of materials design, and a Template for developing teaching and learning materials with guiding questions.

Pedagogical Approach

The pedagogical approach of this unit is inquiry-based learning. All activities are guided by a question. Starting with one or more initial questions, the student is encouraged to research and carry out activities (hands-on and minds-on), to research information, answers and explanations for the situations or processes under analysis, eventually leading to new questions and new explorations. This unit is focused on action-oriented learning. Through collective discussions, the participants are going to reflect about human impact on water and sociopolitical actions to mitigate that impact. Real-life examples are going to be used to raise questions.

Environmental Education: Importance of the theme

The aim of this Unit is to provide teachers, student teachers as well as students in schools situations to reflect about water quality, water consumption and actions to save water. It aims to focus on the benefits of protecting water resources, both environmental sustainability and human well-being. Understanding, sharing and discussing the experiences and learning that has taken place, together with individual and collective reflection on all the activities carried out, will allow for the construction of in-depth, integrated and meaningful knowledge about water protection.

Piloting of the materials within TAP-TS

The materials of Unit 3 were first presented during the Active Learning Event 1, in Santarém, Portugal, as a workshop for practicing teachers, student teachers and teacher educators. They were further developed and tried out in initial teacher education courses, in Santarém. The materials are also presented as a Moodle course on TAP-TS Platform - https://tap-ts.eu/course/view.php?id=13

UNIT Overview

Main Topic	Target Group	Duration	Knowledge Area/ Subjects in School	Activities	Suggestions for Possible assessment
Actions to protect water	Pre- and in-service teachers, materials are provided for students in school (6-12y.o.)	Min 420 min	Knowledge area: • Environmental education • Science • Mathematics • (Digital) media education • Citizenship education	**Start-up:** Activity 1. The world's water Activity 2. Water distribution on Earth **Development:** Activity 3. Water around me Activity 4. My actions to save water **Consolidation:** Activity 5. Creation of a digital resource about water saving **Follow up:** Activity 6. Reflection about teacher practice	Rubric to students evaluate their progress
Intended Learning Outcomes	**Having worked through the activities and materials, students will be able to:** ✓ Understand water as a fundamental condition of life itself, the importance of water quality and quantity, and the causes, effects and consequences of water pollution and water scarcity. ✓ Understand that water is part of many different complex global interrelationships and systems. ✓ Communicate about water pollution, water access and water saving measures and to create visibility about success stories. ✓ Save water modifying daily behaviors.				
Prior Competencies	Optional/ideal: Unit 1. Introduction to sustainability and environmental education.				
Required materials	• Paper • Worksheets • Robot and board • Model of a house • Laptops, tablets or smartphones • Scratch game				
Cooperation/ Networking	• Local water treatment facilities. • Local NGOs dedicated to environmental protection				

Practical Notes for Teachers	Teacher should identify an outdoor location where students can identify different water usages.		
Addressing GreenComp	**Embodying sustainability values**		
	X	1.1 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.
		1.2 Supporting fairness	To support equity and justice for current and future generations and learn from previous generations for sustainability.
		1.3 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		
	X	2.1 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.
	X	2.2 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.
	X	2.3 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		
		3.1 Futures literacy	To envision alternative sustainable futures by imagining and developing alternative scenarios and identifying the steps needed to achieve a preferred sustainable future
		3.2 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.
		3.3 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		
		4.1 Political agency	To navigate the political system, identify political responsibility and accountability for unsustainable behaviour, and demand effective policies for sustainability.
	x	4.2 Collective action	To act for change in collaboration with others.
	x	4.3 Individual initiative	To identify own potential for sustainability and to actively contribute to improving prospects for the community and the planet.

UNIT DESCRIPTION

Start-Up

The aim of the start-up activities is to impart students with a comprehensive understanding of Earth's water, encompassing both its quantity and distribution.

Estimated Duration 60 min

Activity 1. The world's water

Small group activity aimed to raise students' awareness that water is scarce on Earth.

GreenComp Reference

1.1 Valuing Sustainability

1.3 Promoting Nature

30 min

Preparation for Activities: Classroom space should be organized for group work.

A Note for a Teacher: Although water is everywhere, liquid fresh water, which people and many other life forms need to survive, is scarce. Primary school students should understand that water is a fundamental condition of life itself, the importance of water quality and quantity, and the causes, effects and consequences of water pollution and water scarcity.

What do your primary school students know about the amount of water Earth has? A large amount of water? A small amount of water?

Description

How much water is on Earth?

1. Show figure 1 on the **Worksheet. The world's water**.
2. Organize students in small groups and ask them to reflect about the water amount on Earth. Questions to guide the discussion:

    - Contrast the volume of the Earth with the volume of water on and above the Earth. What conclusions can be drawn from this comparison?

	• Compare the total volume of the water on and above the Earth, with the total volume of liquid fresh water. What can you conclude? • Compare the total volume of the liquid fresh water with the total volume of the fresh-water on lakes and rivers. What can you conclude? 2. After discussion in small groups, students should reflect and share ideas on a digital educational resource, such as Padlet®.	
Activity 2. Water distribution on Earth This is a small group activity aimed to raise students' awareness that water is scarce on Earth. **GreenComp Reference** *1.2 Valuing Sustainability* *1.3 Promoting Nature*	**Preparation for Activities:** Classroom space should be organized for group work. **A Note for a Teacher:** There is water on the atmosphere, biosphere, geosphere and hydrosphere. For some primary school students is easy to identify water on oceans and rivers, but harder to identify it on the atmosphere or in living beings. **How do your primary school students understand the Earth' water distribution?**	30 min
	Description **How is water distributed on Earth?** 1. Observe the video How much water is on Earth?. 2. Organize students in small groups and ask them to reflect about the **water amount on Earth.** Questions to guide the discussion: • Where is water distributed on Earth? • There is more saltwater or freshwater on Earth? • Which is the percentage of freshwater on Earth? • Where is freshwater stored on Earth? 2. After discussion in small groups, students should reflect and share ideas on a digital educational resource, such as Padlet® or similar.	

Development

The aim of the development activities is to impart students with a comprehensive understanding of where is water in their local environment and how water is used and promote individual or collective actions to save water.		**Estimated Duration 210 min**
Activity 3. Water around me Small group activity in outdoor settings aimed to raise students' awareness of water presence and usage in their local environment. **GreenComp Reference** *1.1Valuing Sustainability* *1.3 Promoting Nature* *3.3 Exploratory Thinking* *2.3 Problem Framing*	**Preparation for Activities:** Students should be organized in small groups. Formal authorizations for the realization of the outdoor activity should be requested. **A Note for a Teacher:** This activity requires the teacher to collaboratively identify a local area within the community with students, where they can conduct research on water usage. **How can you raise your students' awareness of the water around them, the ways it is used and what they can do to protect water?** **Description** **Where is water around you? How water is used? There are problems on water?** 1. Initially, students and the teacher should collaboratively identify a location within the local community for researching about water. For that aim, physical maps or digital maps, such us Google Maps®, can be used. Park of Nations, in Lisbon, Portugal, is the example given in this LTP. 2. Subsequently, at the outdoor site, students should employ either a physical or digital map, to: • search for places with water, mark them in the map, collect pictures; • register some ideas of how water is used (e.g. for watering plants, in fire hydrants, etc.); • register eventual problems found (e.g. pollution, water waste, etc.).	120 min

<table>
<tr><td></td><td>3. Later, in the classroom, these pictures and information should be organized and shared in a common resource, such as Genially® or similar. This is an example of this product: One Earth | My actions to protect water _ Parque das Nações, Lisbon, Portugal</td><td></td></tr>
<tr><td rowspan="2">Activity 4. My actions to save water
This is a small group activity aimed to raise students' awareness of water protection, with a focus on water saving.

1.1Valuing Sustainability
1.3 Promoting Nature
3.3 Exploratory Thinking
2.3 Problem Framing
4.2 Collective action
4.3 Individual initiative</td><td>Preparation for Activities: Teacher organizes students in six small groups and presents the activity. This activity can be delivered in-person or online.

A Note for a Teacher: Teacher can present to the students the instructions for each task in paper or give them access to the digital resource. Each group starts in a different station. The teacher defines the maximum time for each group complete the task, in each station (e.g. 10 minutes).</td><td rowspan="2">90 min</td></tr>
<tr><td>Description

What can you do to save water?

The activity My actions to save water is based on a physical setting with different stations. In each station the students are invited to solve questions or challenges about water saving. Teacher can implement this activity using one of the following two strategies (A or B):

Strategy A. Creation of the physical stations and asking students to solve the tasks on the Worksheet. My actions to save water: Practical activities, in small groups.

Organization proposal and resources for each station:

<table>
<tr><td>Station 1</td><td>Worksheet. My actions to save water | Station 1 | Task 1.
Worksheet. My actions to save water | Station 1 | Task 2; Smartphone or laptop with internet.</td></tr>
<tr><td>Station 2</td><td>Worksheet. My actions to save water | Station 2 | Tablet or laptop with keyboard and internet.</td></tr>
</table>
</td></tr>
</table>

	Worksheet. My actions to save water | Write an action to save water in the kitchen.
Station 3	Worksheet. My actions to save water | Station 3 | Task 1; Blue round dot stickers labels; Scissors. Worksheet. My actions to save water | Station 3 | Task 2 – 2.1 Worksheet. My actions to save water | Station 3 | Task 2 – 2.2. Worksheet. My actions to save water | Write an action to save water in the laundry room.
Station 4	Worksheet. My actions to save water | Station 4 | Task 1; Three containers identified as A, B and C; 26 balls with an appropriated dimension to be introduced in the containers. Worksheet. My actions to save water | Station 4 | Task 2.
Station 5	Worksheet. Resources for robot board | Station 5. Worksheet. My actions to save water | Write an action to save water in the bathroom.
Station 6	Worksheet. My actions to save water | Station 6; Model of a house; Material to build a system to collect rainwater (examples: Flexible plastic tubing; material to create a rain guttering; material to create a gutter brackets; container to store the rain; balls or marbles to simulate the rain). Worksheet. My actions to save water | Write an action to save water in outdoor.

Teacher should explain that when he/she give them a signal, each group should move to another station, until all groups complete the tasks of the six stations.

Students should write actions to save water, related with the rooms represented in the house. A suggestion is that students can write their ideas in physical speech balloons (Figure 1).

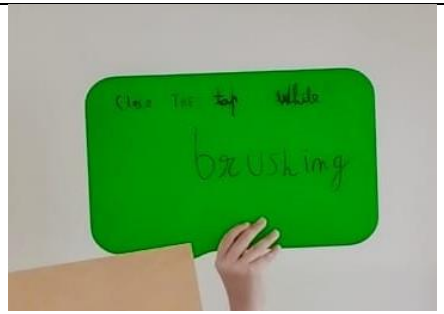


Figure 1. Example of a student idea for saving water on the bathroom ("Close tap while brushing"), presented on the TAP-TS Active Learning Event 1, in Santarém, Portugal, on April 2023.

Ask students to share and discuss their actions with the class.

Strategy B. Ask students to solve in small groups the tasks using this digital resource: **My actions to save water!** The students can access the digital resource using QR-Code of slide 1 .

Ask students to write actions to save water, related with the rooms represented in the house.

Students can share their actions to save water in a digital educational resource, such as Padlet® or similar.

Ask students to share and discuss their actions with the class.

The **Worksheet. My actions to save water: Solutions proposed** presents solutions of each task.

Consolidation

The aim of the consolidation activities is to create a digital resource about water saving.

Estimated Duration 120 min

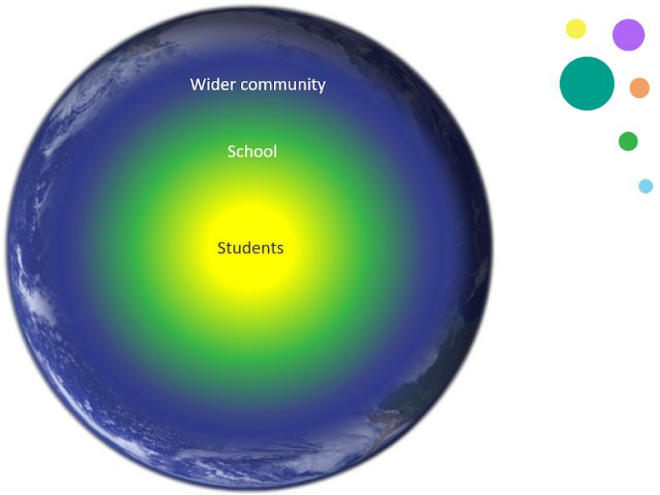
Activity 5. Creation of a digital resource about water saving Small group activity aimed to raise the community awareness of water protection, with a focus on water saving. *1.1Valuing Sustainability* *1.3 Promoting Nature* *3.3 Exploratory Thinking* *2.3 Problem Framing* *4.2 Collective action* *4.3 Individual initiative*	**Preparation for Activities:** Classroom space should be organized for group work. **What can you do to raise the community awareness about water saving?** 1. Ask students to select the digital resource that they are going to use to create a poster about water saving (e.g. Canva®; PowerPoint®; Genially® or other). 2. Students, in group work, decide about the water saving actions they want to present in the poster. 3. Students should share and discuss their work with the community. (e.g in-person presentations to the community; using social media to share their work, etc.). 4. Ask students to fill the **Worksheet. Self-evaluation**.	120 min

Follow-Up

The aim of the follow-up activities is to reflect about the teacher practices.	**Estimated Duration 30 min**
Activity 6. Reflection about teacher practice This is an activity aimed at helping reflection (individually and/or with colleagues) on how the previous activities contribute to developing sustainability competences and acting in a more sustainable way.	30 min

1. How can I mobilize the activities in my teacher practice?

Please reflect on two or three of the following dimensions at three levels of engagement (students - teacher; school; and wider community and beyond):



Dimension 1. Learning objectives:

In what ways do these activities contribute to the global educational goals for your students? You might consider in particular LTP methods, materials, tools and activities you would or have implemented/transferred from the TAP-TS LTP into your regular teaching curricula.

	Within the school or learning context, how have the activities helped the learners in terms of embodying sustainability values, acting for a sustainable future and/or envisioning a more sustainable future? How have the activities added to the knowledge and understanding of the learners in terms of working with others in the broader community to create inclusive visions for a more sustainable future? **Dimension 2. Integration with different subjects:** In what ways the activities could engage your students with different knowledge areas and subjects of the curriculum? In what ways these activities could be connected with different subjects of the curriculum? How have the activities contributed to collaboration with others at school or institutional level to approach a sustainability issue from different perspectives, knowledge areas and contexts? In your opinion, do the LTP materials, tools and methods you have implemented also offer potential for use in other subjects? If so, in which subjects? How have the activities encouraged students to draw on different perspectives, and subject knowledge to identify interconnections, and reflect on one's own environmental, cultural and economic impact? **Dimension 3. Inclusion:** Can the previous activities contribute to all students' participation and learning? What actions can you take to ensure the learning of all students? How have the activities contributed to engage with different perspectives to consider sustainability challenges and opportunities?	

	How do the activities help reflect on, identify, envision or even shape the trajectory towards a collective preferred future that includes various perspectives, cultures, traditions, and are grounded in values for sustainability? **Dimension 4. Environmental / Sustainability awareness:** To what extent do the activities promote awareness and responsibility among your students? Did the implemented LTP materials, methods or tools increased or rather limited the opportunity to increase students´ environmental awareness? How have the activities encouraged the students to be aware of their individual and collective impact on nature, and provided opportunities to restore it at school level? How have the activities contributed to grasp connections and interactions between natural events and human actions? **Dimension 5. Digital resources and equipment:** Do the current resources and equipment available in your institution adequately support the activities you have selected and implemented from LTP materials, or are there enhancements needed? How did you try to enable students to use resources for learning at school in a sustainable way? Did the activities encourage students to assess and question their needs to carefully manage resources in the pursuit of longer-term goals and common interests? How did the activities help them to think critically about information sources and communication channels on sustainability to assess the quality of the information they provide?	

Dimension 5. Community involvement:

To what extent can you involve the local community or connect with community issues related to the sustainability theme approached?

Have the selected and implemented LTP methods, tools and materials encouraged you to initiate cooperation with external partners (associations, companies, NGOs, etc.) to enrich learning experiences? If so, in which areas are you aiming for cooperation?

To what extent do the activities engage in democratic decision making and civic activities for sustainable development?

How does your teacher practice encourage students' intentions and willingness to give back to the community and nature?

Dimension 7. Assessment and feedback:

Have you adapted the original assessment methods or the requirements for students after integrating the LTP materials, methods, or tools into your existing teaching concept? If yes, in which way/how?

To what extent does your teaching practice encourage students to use evidence, combine knowledge and resources to analyse and evaluate futures and their opportunities, limitations and risks, and contribute to decision-making at school level.

To what extent does your teaching practice encourage students to use evidence, combine knowledge and resources to analyse and evaluate futures and their opportunities, limitations, and risks, and contribute to decision-making, and become agents of change.

Glossary

Water: A substance composed of the hydrogen and oxygen chemical elements, and existing in gaseous, liquid, and solid states, on Earth.

Water saving: Practice of using water efficiently to reduce unnecessary water usage.

Glossary of Icons

- Video

- Quiz

- Worksheets

- Editable Worksheets

- Various Media, e.g. Learning Apps

- Text to Read

- A question to Respond or a Question for Reflection

- A Discussion

- A task for an inquiry or search

- Focusing Activity

- A Reflection Activity

- An Activity for Action

- a short note for a teacher

Worksheets and links

Start-Up

Activity 1. The world's water

- Worksheet The world's water

Development

Activity 2. Water distribution on Earth

- Video How much water is on Earth?

Activity 3. Water around me

- Genially® One Earth | My actions to protect water _ Parque das Nações, Lisbon, Portugal

Activity 4. My actions to save water

- Worksheet My actions to save water: Practical activities
- Worksheet My actions to save water: Solutions proposed
- Access to Scratch game | Station 2 https://scratch.mit.edu/projects/936288327
- Worksheet Resources for robot board | Station 5
- Genially® One Earth | My actions to save water!

Consolidation

Activity 5. Creation of a digital resource about water saving

- Worksheet Self-evaluation

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TAP-TS Roadmap

TAP-TS Roadmap has three main goals: (1) for the TAP-TS partners as a roadmap to design LTPs; (2) for teachers and student teachers to design materials for teaching sustainability; (3) evaluation of LTPs. Explore the visualisation on the next page.

TAP-TS Roadmap: the Steps / stages in the TAP-TS LTPs Design Journey	
1: Clarify the Goal	Our overarching goal is to enable learners and teachers to think and act sustainably. To actively participate in the discourse on sustainability, the topics must also be addressed - sustainably - in schools and universities. The goal of TAP-TS is to create learning and teaching packages for this purpose in the following areas: 2.1 A Sustainable Europe. 2.2 Sustainability and Digitality. 2.3. Sustainability and Environmental Education. 2.4 Climate Crisis Resilience. 2.5 Dealing with Climate Disinformation. 2.6 Green Citizenship in/for Europe. 2.7 Sustainable Entrepreneurship Education.
2: Competency Areas	The LTPS should be aligned with the interconnected four competences defined in the Green Comp Framework: • Embodying sustainability values • Embracing complexity in sustainability • Envisioning sustainable futures • Acting for sustainability
3: Networking & Bundle Expertise	There are many exciting topics. 1. Find a focus: what driving question is at the centre of your LTP. 2. See what resources are available (competencies, teaching-learning materials, etc.). 3. Network with colleagues and partner institutions regionally and nationally.
4: Working through the design process	Teaching Sustainability should be: action-oriented learning; hands-on; focussing on real life challenges; stimulate creative collaboration between teachers and learners; visions-oriented; participatory and action oriented . Approaches to teaching sustainability may be inquiry-based learning; explorative learning; networked learning; participation learning aimed at problem framing. Teaching Sustainability may incorporate the following activities: collaborative projects, future framing workshops, research and analysis, discussion.
5: ASSESSMENT DESIGN And REFLECTION	In Education for Sustainability assessment can be multifaceted and primarily encourage reflection and be evidence based. There is not always ONE right answer. The goal should be to RAISE QUESTIONS. TS is not about teaching the „right“ behaviour, but about practising a critical perspective. Give TS an important place in curricula and implement credits, badges, or awards for it.
6: PUBLISH TO TAP-TS PLATFORM	Can you and where can you publish your materials under a Creative Commons license as free as possible. Because that is sustainable!

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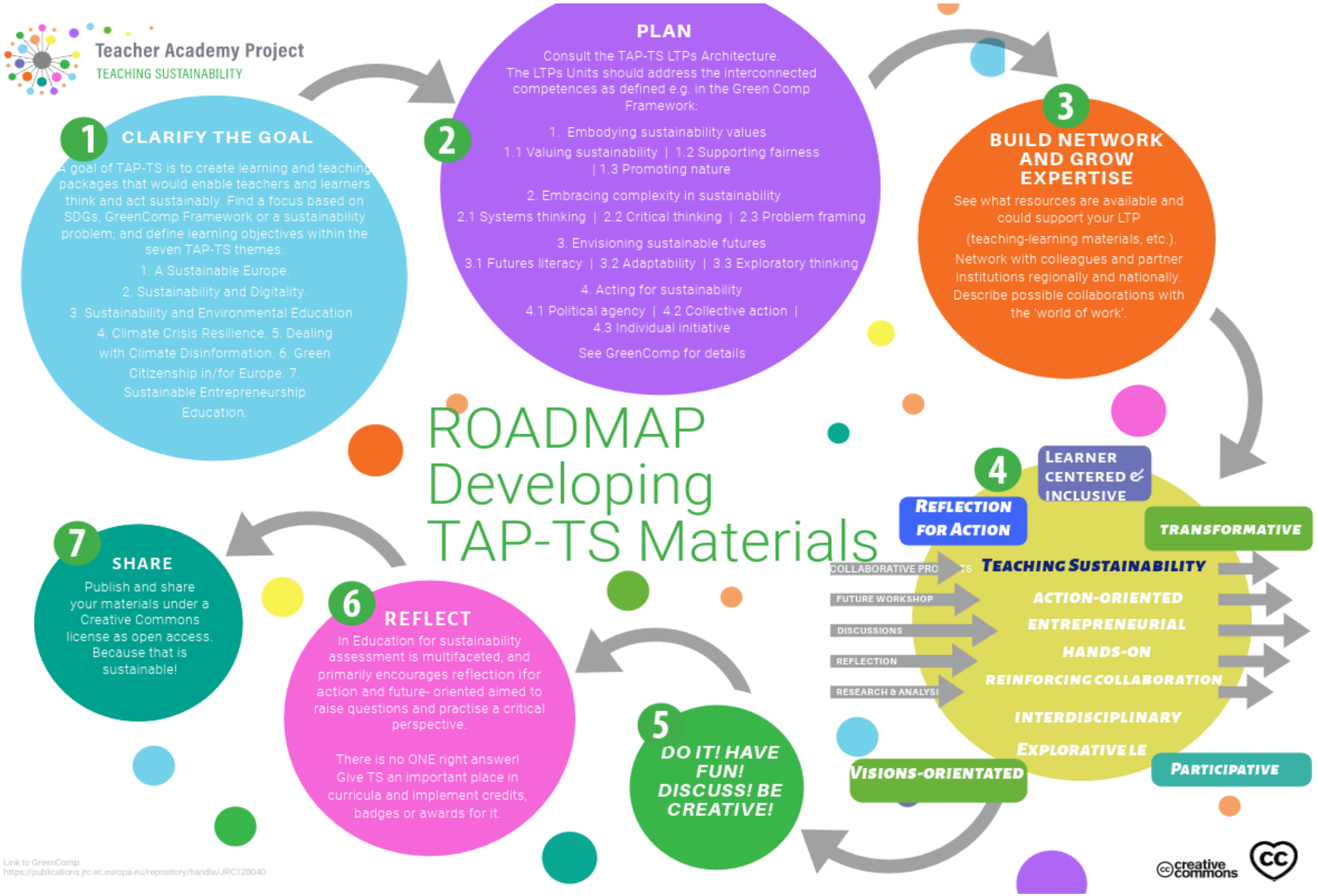
ROADMAP Developing TAP-TS Materials



Teaching Sustainability: Learning activity Template

1. Introduce yourself!

My name:
My country:
My role:
My school:
My class:

2. OVERVIEW

Provide a brief description of the learning activity, including information about the targeted age group and duration. Clearly state the motivation behind your learning activity and explain which elements of the curriculum your learning activity is related to.

Age Group:

Duration:

Related Themes of Sustainability:

Description:

3. LEARNING OUTCOMES

What are the learning outcomes of this learning activity, and which key GreenComp competences does it promote?

4. LEARNING APPROACH

Having in mind the learning outcomes, what active learning approaches will be applied?

Specify the engagement strategies and sequence of learning tasks that students will develop in the context of the activity. Explain how GreenComp competences will be promoted.

What will be the role of the teacher, and what will be the students' role? How will the students work—individually or in groups?

5. DIGITAL RESOURCES

Which digital technologies, including tools, services, and resources, will be utilized in the activity? Additionally, how will these digital technologies be effectively integrated to enhance lesson outcomes and student understanding?

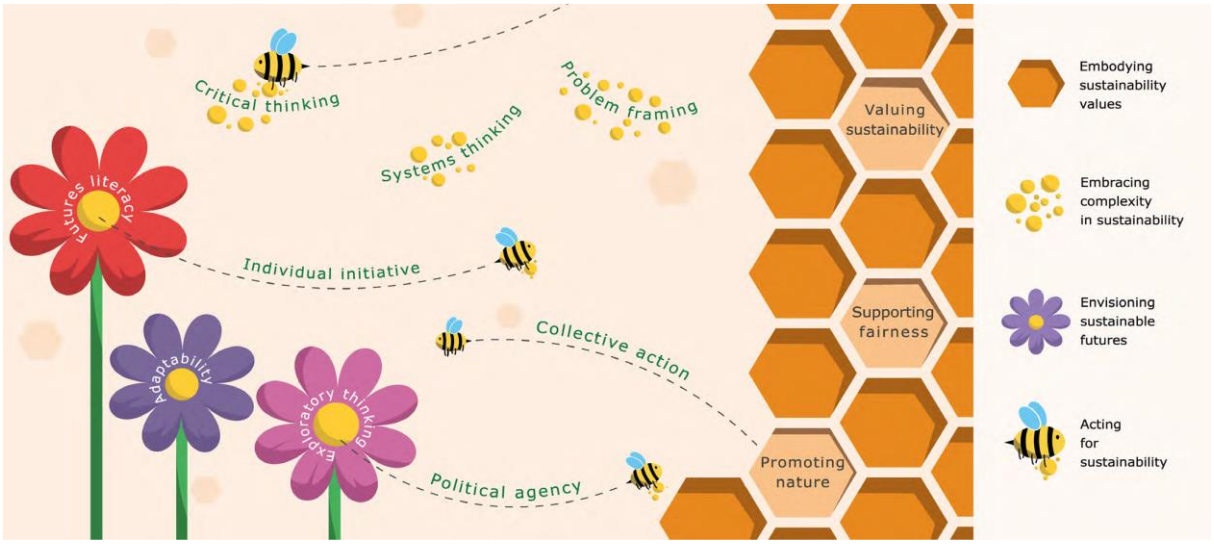
6. ASSESSMENT

What assessment strategies and instruments will be employed to evaluate student learning?

GreenComp Framework: the European Sustainability Competence Framework

Within the TAP-TS Project, *GreenComp (Bianchi et al., 2022)* serves the following purposes: design of learning and teaching packages; development of TAP-TS professional development activities, (self)-reflection, and evaluation. The aim of GreenComp is to foster a sustainability mindset by helping teachers and students develop the knowledge, skills and attitudes to think, plan and act with empathy, responsibility, and care for our planet.

Visual representation of *GreenComp:*



GreenComp consists of 12 competences (in bold) organised into the four areas (in italics) below:

- *Embodying sustainability values, including the competences*
- **valuing sustainability**
- **supporting fairness**
- **promoting nature**

- *Embracing complexity in sustainability, including the competences*
- **systems thinking**
- **critical thinking**
- **problem framing**

- *Envisioning sustainable futures, including the competences*
- **futures literacy**
- **adaptability**
- **exploratory thinking**

- *Acting for sustainability, including the competences*
- **political agency**
- **collective action**
- **individual initiative**

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

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