Teacher Academy Project
TEACHING SUSTAINABILITY

SUSTAINABILITY AND DIGITALITY

Learning and Teaching Package 3

UNIT 3: THE DIGITAL TECHNOLOGY NETWORK ON THE GLOBE

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Contents

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Overview

The LTP introduces the relationship between digitality and sustainability. Knowledge and pedagogical materials on topics such as harmful effects of digital technologies on the environment, the importance of digital technologies to deal with the climate crisis, and the social inequalities and social dependencies arising from digital infrastructures are addressed.

“Unit 3 – The Digital Technology Network on the Globe” explores how we are connected globally in the digital era. Societies and technologies build and shape each other, but what are the ecological and social benefits of technological innovation? What are the ecological implications of the digital transformation and the associated ever-increasing demand for energy? From a social perspective, we need to ask who benefits from technological innovation, who has access to it and who can actively participate in it to ensure democratic and just societies in a global digital world. In the Unit the following questions are explored: Have you ever thought about the social or environmental consequences of our technological innovations? What are their effects on our social coexistence around the world? Why is the global demand for energy constantly increasing? What is the impact of AI on the environment and the climate crisis? In which parts of the world do people benefit from technological innovation? In this context, it is important to look critically at one's own ideas about the world and to identify possible misconceptions. The Unit materials invite to think about these aspects in more depth.

Pedagogical Approach

This unit attempts to vividly convey the unwieldy topic of post/-colonial relations. This is done by working with different materials and the - hands-on - representation of digital connectedness across the globe. The participants are encouraged to reflect on the experiences and to transfer this into the conception of a teaching-learning setting with students. The materials are 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.

Sustainability and Digitality: Importance of the theme

The aim of this LTP is to provide teachers, student teachers as well as students in schools research-based but easy accessible information on the use of digital devices which accompany us and our children at almost every moment of our lives. It aims to focus on the benefits and risks of living in the digital age, and to imagine a more sustainable future with technology. At the centre of the LTP is the multifaceted relationship between digitality, sustainable development and our social community.

Piloting of the materials within TAP-TS

The materials of Unit 3 are first presented during ALE 4 in Santarem, Portugal as a workshop for practicing teachers, student teachers and teacher educators. They are going to be further developed and tried out in primary schools in Vienna. The materials are also presented as a Moodle course on TAP-TS Platform - https://tap-ts.eu/course/view.php?id=12

UNIT Overview

Main Topic	Target Group	Duration	Knowledge Area/ Subjects in School	Activities	Suggestions for possible assessment
Understand the historical development of the digitally-connected world and the digital connectedness across the globe.	Pre- and Inservice-Teachers for students (6-10y), some materials are useful for students (6-10y)	Min 180 min; Run as a half-day workshop or project work for a month: 45 mins – 1 hour a week.	The materials can be integrated into the curriculum or given as a workshop. Knowledge areas would be: ✓ (Digital) media education ✓ Geography ✓ Technics and Arts	**Project Journey 1: Find Your Footprint** **Start-Up** Activity 1. What is Climate Change? Activity 2. What do you know about the continents? **Development** Activity3. What is a carbon footprint? **Consolidation** Activity 4. Find your Footprint **Project Journey 2. Mapping Digital Technology** **Start-Up** Activity 1. What do you see? Activity 2. How does the Internet work? **Development** Activity 3. Submarine Cables, Data Centres & E-Waste **Consolidation** Activity 4. Think about the Internet **JOINT Follow-Up** Activity 1. Reflection and Plan for Action Activity 2. Reflection on Teacher Practice	Project work

Intended Learning Outcomes	**Having worked through the activities and materials, students will be able to:** ✓ Reflect on digital connectedness across our globe. ✓ Discuss the concept of "Carbon Footprints". ✓ Know which countries are the top CO2-producting nations. ✓ Reflect on why some countries have smaller and some have bigger carbon footprints. ✓ Assess the impact of their own media usage on the environment at a global scale.		
Prior Competencies	optional/ideal: Unit 1 – Relationship between Digitality and Sustainability and / or Unit 2 – My Smartphone, Planet Earth and Me		
Required materials	• Illustration of a world map on paper (e. g. DIN A3) or carpet with a world map • Cords, pencils, wooden blocks...		
Cooperation/ Networking	• A possible collaboration with an art museum or gallery on the subject of looted art from colonial territories can also provide further insights. Cultural associations, interest groups or art funding organisations could also be interesting cooperation partners.		
Practical Notes for Teachers	The unit is organised as two workshops with two different but related foci. Both invite us to consider the materiality of digitality from a global perspective. Workshop 1 asks to think about the carbon footprint and the actions we can take and is more appropriate for primary level. Workshop 2 provides a knowledge base about global connectivity via the Internet and invites to think critically about its organisation from a socio-ecological perspective. It may be more appropriate for secondary school students or adapted for primary school settings. The two workshops can be seen as small project journeys, each going through the stages of start-up, development and consolidation, and ending together with follow-up activities to discuss the key points and reflect on the process.		
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.
	X	1.2 Supporting fairness	To support equity and justice for current and future generations and learn from previous generations for sustainability.
	x	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		
	X	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
	X	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.
	x	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		
	X	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

Project Journey 1: "Find the Footprint"

Start-Up	Estimated Duration
As an introduction, the continents and some countries are worked out together. The unit starts with the question "What do you know about our continents?" and offers a mini-quiz. The start-up activities are suggestions, but it will be useful to use your class materials around the continents. It is also helpful to have materials that can be used to explain in a child-friendly way why the earth is warming due to climate change.	**60 min**

Activity 1: What is Climate Change? The activity introduces to the topic of climate change, and the role of carbon footprint in an easy way. ***GreenComp reference:*** *1.1 Valuing Sustainability; 1.3 Promoting nature; 3.3 Exploratory thinking*	**Preparation for Activities:** prepare the classroom to show the video on Climate Change. You might find a more appropriate video in your language. **Description** 1. Discuss with the students what is the difference between climate and weather. This resource can help you. 2. Watch Climate Change According to a Kid Video to explain what climate change is. 3. Discuss with your students: • Why is Earth warming? • What does carbon have to do with this? • Why does climate change matter? Thinks of how Earth as a system works. To explore any of these questions further, you can visit the website - https://climatekids.nasa.gov/kids-guide-to-climate-change/ and play the climate time machine game.	40 min

Activity 2: What do you know about our continents? The activity aims to introduce the topic of carbon footprint, but also growing on the knowledge around different continents.	**Preparation for Activities:** Organize your class into sized groups and provide each group with a printed world map or provide one large map for all. Have worksheets for Workshop 1, pages 1 and 2 ready. **Description** 1.  Ask students to look at the world map and explore the following questions: • How many continents are there? • What do you know about these continents? • What makes each continent special? 2.  Ask the students to complete the tasks in the Worksheet for WS1, pages 1 and 2.	20 min

Development		Estimated Duration
The main aim of the activities is to explore what energy is used for and how unevenly it is consumed around the world.		**50 min**
Activity 3: What is a carbon footprint? The activity introduces to the concept of footprint, and explores what we use energy for when it concerns technology, also in comparison globally ***GreenComp reference:*** *1.1 Valuing Sustainability; 1.3 Promoting nature; 3.3 Exploratory thinking; 2.2 Critical thinking; 2.3 Problem framing*	**Preparation for Activities:** Organize your class into sized groups and provide each group with a printed world map or provide one large map for all. Prepare WS1 worksheet pages 3 to 9. **A note for a teacher:** If you want to explore more activities related to energy and saving energy, we recommend to look at LTP 3 Unit 4. **Description** 1. Cut out the boxes and play pairs with the things that use energy (electricity) in everyday life (worksheet 3). 2. Work with worksheets 4 to 6 and learn what is meant by the carbon footprint. If you think you need more resources to explain, here is a helpful one - https://climatekids.nasa.gov/carbon/ 3. Use the footprintmap to find out about which countries have bigger and smaller ones (worksheet 7). 4. After learning more about carbon footprint, and how unevenly it is distributed on planet Earth, ask the students to discuss the following questions (worksheet 8): • Why do some countries have such a big carbon footprint? What do they use so much energy for? • Which countries need less energy? Where are they on the map? • How can you minimize your individual carbon footprint? 5. Draw your footprint: Follow the steps on worksheet 9. Think about how you use energy in your daily life. Look at the symbols and draw them in your footprint.	30 min

Consolidation		Estimated Duration
The activities invite to reflect on one's own use of energy while using digital devices and beyond, and to think about possible strategies to save energy.		
Activity 4: Your Footprint. Think what you can do. The activity suggests some ideas to reduce your carbon footprint. ***GreenComp reference***: *4.2 Collective action;* *4.3 Individual initiative*	**Preparation for Activities:** Organize your class into sized groups and provide each group with a printed world map or provide one large map for all. Have WS worksheet page 10 ready. **Description** 1. Every search query, every video streamed and every photo stored in the cloud consumes electricity. Here are eleven tips on how to "travel with a smaller foot"…. 2. Work with worksheet 10 and discuss with the pupils what actions they can take. 3. You can also organize this activity as a bingo game. Hand out the bingo cards (in worksheet 3), and ask to choose the ones which are related to energy saving.	20 min

Project Journey 2: "Mapping Digital Technology"

Start-Up		Estimated Duration
This project journey begins with introductory activities to encourage critical thinking about the way our world is globally interconnected, the equity of this interconnectedness, its materiality and its impact on our environment.		**20 min**
Activity 1. What do you see? The activity is aimed to bring into focus the questions of global digital connectedness and the historical development of the digitally-connected world. ***GreenComp** references:* *2.2 Critical Thinking* *1.2 Supporting fairness*	***A Note for Teachers:** This is a short activity to gather thoughts and ideas that can be done in pairs or individually and discussed in class. If you want to go deeper yourself, or start a conversation with an adult audience, there are more resources in the Moodle course - https://tap-ts.eu/course/view.php?id=12&section=5#module-1368. Make sure you log in as a guest.* Here are some background materials for you to dive into the topic: Thin underwater cables hold the internet Video "The Carbon Impact of AI" (A journal article) The Story of Energy Video How the Internet Works – STEM For Kids Check out the Global Footprint Network Interactive Map to explore ecological footprint globally. **Description:** 1. Show Chris Harrison's internet map World Connection Density and The Submarine Cable Map and ask students to make notes of **what they see** and guess what these maps might be all about. 2. Build the conversation around the following questions:	5 min

<table>
<tr><td></td><td>What does this have to do with the Internet?
What do we need to be connected globally?
Why do you think the number of undersea cables and Internet access points is so different?
What are some possible reasons?</td><td></td></tr>
<tr><td>Activity 2: How does the Internet work?
The activity engages in a game to start thinking how the internet works, and how our digitally connected world works technically.

GreenComp references:
3.3 Exploratory thinking</td><td>Preparation for Activities: Organize your class into sized groups and provide each group with a printed world map or provide one large map for all. Have WS 2worksheet page 1 ready.
Description
1.  Work with worksheet page 1: Let the students cut out the boxes and let them play in pairs with the internet terms.

2.  Ask students to think about assumptions about what these terms have to do with the global Internet.</td><td>15 min</td></tr>
</table>

<table>
<tr><th>Development</th><th>Estimated Duration</th></tr>
<tr><td colspan="2">After brainstorming in the start-up phase, the students now learn step by step more about the paths that data takes when we use the Internet. This phase starts with a short video showing how our global connectedness is based on a transatlantic cable laid at sea more than a century ago. After the video has been shown, the students are given the task of finding out more about undersea cables; a website helps them to do this. Pupils place strings on the world map to show where the various submarine cables are located. Additionally, they also present what else they have found out about submarine cables.</td><td>80 min</td></tr>
<tr><td>Activity 3: Submarine Cables, Data Centres & E-Waste
The activity aims to give knowledge basis around how data travel, how we connect and how much electronic waste our digital lifestyle causes.

GreenComp reference:
3.3 Exploratory thinking;
2.3 Problem framing</td><td>Preparation for Activities: Organize your class into sized groups and provide each group with a printed world map or provide one large map for all. Have WS2 worksheet pages 2 to 5 ready and also a projector. The main idea of this activity is to use interactive world maps for research. The results are then displayed on a physical world map using symbols. The activities can be done one after the other or in parallel groups.

A Note for a Teacher: The materials can be more suitable for secondary level. There also may be explanations of how the internet works and what undersea cables are in your language.

Description

An undersea cable is laid in the sea or in waterways. Usually, such cables either carry electricity or they are used for telecommunication. When you use the internet, the information is usually sent through such cables.
1. Work with the worksheet page 2 to explore how streaming a movie happens as an example of how internet travels.
2. Next show the video on undersea fiber optic cables. Ask the students to take notes.
3. Discuss together what surprises them most.</td><td>80 min</td></tr>
</table>

	4.  Next use worksheet page 3 and the website about submarine cables to find out about how computers are connected. 5.  To visualize, put threads to show the cables (groupwork). Ask the students to imitate how the cables connect us digitally. You can play a game depicting a signal going from Point A to B. 6.  Next use worksheet 4 and the website about data centres to find out major **data centres and server farms** are located **around the world.** 7.  To visualize, take wooden cubes (groupwork). Ask the students to place them on the countries and continents that have the largest data centres and server farms. 8.  Next use worksheet page 5 and the website about e-waste to find out which countries produce a lot of e-waste and which don't. 9.  To visualize, take e-waste samples (groupwork). Ask the students to place them on the countries which produce a lot of e-waste and which don't.	

<table>
<tr><th colspan="2">Consolidation</th><th>Estimated Duration</th></tr>
<tr><td colspan="2">The aim is to reflect and discuss questions related to global digital connectedness.</td><td>20 min</td></tr>
<tr><td>Activity 4: Think about the Internet
The aim is to discuss the knowledge from the previous activities.

GreenComp reference:
2.2 Critical thinking; 2.3 Problem framing</td><td>Preparation for Activities: You will need WS2 worksheet page 6 and the world map with all the different symbols on it.

A Note for Teachers: There is a final discussion round in which the students reflect on whether and how their view of global networking has changed.

Description
1. Raise questions about the things you learned in this workshop today:

• How does the internet work in your home and in your town/village?
• Why is your signal sometimes very fast and sometimes very slow?
• Where can we find big server farms?
• Why are big server farms not good for our climate?
• Where can we find lots of submarine cables? Where just a few? Why?
• Why do you think some countries have better internet access than others?
• What are the drawbacks of a bad internet connection?
• Has your view of the digital network on the globe changed?</td><td></td></tr>
</table>

<table>
<tr><th colspan="2">Joint Follow-Up</th><th>Estimated Duration</th></tr>
<tr><td colspan="2">The aim of the follow-up activities is to reflect about the teacher practices; and think of possible actions students could do for a more sustainable future</td><td>70 min</td></tr>
<tr><td>Activity 1. Reflection and Plan for Action
The emphasis is on action. The students are encouraged to reflect on the use of digital technology based on the knowledge of Unit 3, and to commit and take responsibility.

Green Comp reference: 2.3 Problem framing; 3.1 Futures literacy; 4.2 Collective Action; 4.3 Individual Initiative</td><td>Preparation for Activities: below you will find a number of suggestions inviting your students to reflect and act.

Description

Variant 1. Reflect on the questions in groups. Gather the reflections.

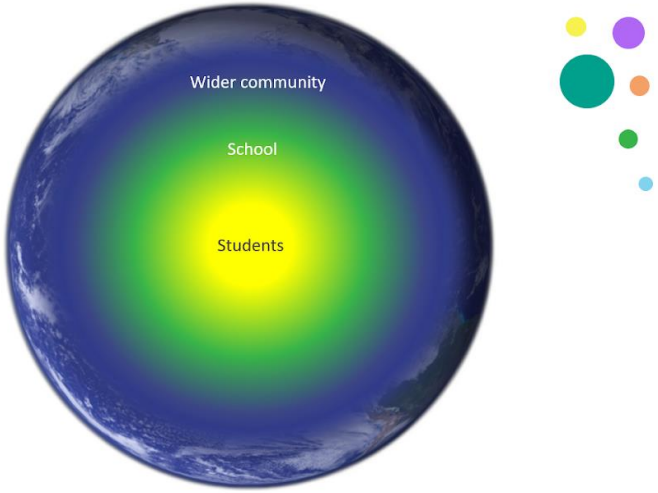
1. What is challenging and what is the problem with using digital devices as we do nowadays?
2. What do we expect to happen based on the current use and production of digital devices?
3. What constructive actions can we do as a group and myself indivitually?

Variant 2. The class can choose and do a mini-project to raise awareness about the current use of digital technology in the school community. A poster can be a good and fun idea.

Variant 3. Challenge yourselves. Here are a number of challenges suggestions. For more, check this resource.

Scavenger Hunt: Go around your home and count all the devices currently on standby and then chat with your family to decide how many you can switch off fully until they are needed.

Unplug on Saturdays: Can you challenge yourself to only use your electronics for one hour on Saturday? You'll save energy and find new ways to have fun at the same time!</td><td>30 min</td></tr>
</table>

	Don't just Standby: Before you head to bed, do a quick check around the home for any entertainment devices or equipment left on standby unnecessarily. Unplug them or turn them off at the socket. (If in doubt check with an adult first).	
Activity 2. Reflection on 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.	**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.	40 min

	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? **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? **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? ✓ **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 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

 - Suggested answers

 - a short note for a teacher

 - a group exchange

Glossary

The collaborative writing of a glossary on the central terms of the LTP 2 is part of the tasks (create an Glossary).

Worksheets and Links

Project Journey 1. Find the Footprint

Start-Up

Activity 1. What is Climate Change

- Climate Change According to a Kid Video
- Climate Kids Website https://climatekids.nasa.gov/

Activity 2: What do you know about our continents?

- WS 1 Worksheet pages 1 and 2 in Handouts

Development

Activity 3: What is a carbon footprint?

- WS 1 Worksheet pages 3 to 9 in Handouts
- The footprintmap

Consolidation

Activity 4: Your Footprint. Think what you can do.

- WS 1 Worksheet page 10 in Handouts

Project Journey 2. Digital Technology Network

Start-Up

Activity 1. What do you see?

- Thin underwater cables hold the internet Video
- "The Carbon Impact of AI" (A journal article)
- The Story of Energy Video
- How the Internet Works – STEM For Kids
- the Global Footprint Network Interactive Map
- World Connection Density
- The Submarine Cable Map

Activity 2: How does the Internet work?

- WS 2 Worksheet pages 1 in Handouts

Development

Activity 3: Submarine Cables, Data Centres & E-Waste

- WS 2 Worksheet pages 2 to 5 in Handouts
- Video on undersea fiber optic cables
- Website about submarine cables
- Website about data centres
- Website about e-waste

Consolidation

Activity 4: Think about the Internet

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- WS 2 Worksheet page 6 in Handouts

Joint Follow-Up

Activity 1. Reflection and Plan for Action

- **https://cartoonnetworkclimatechampions.com/en-gb/challenges**

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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

1 CLARIFY THE GOAL

A goal of TAP-TS is to create learning and teaching packages that would enable teachers and learners think and act sustainably. Find a focus based on SDGs, GreenComp Framework or a sustainability problem; and define learning objectives within the seven TAP-TS themes.

1. A Sustainable Europe.
2. Sustainability and Digitality.
3. Sustainability and Environmental Education
4. Climate Crisis Resilience. 5. Dealing with Climate Disinformation. 6. Green Citizenship in/for Europe. 7. Sustainable Entrepreneurship Education.

2 PLAN

Consult the TAP-TS LTPs Architecture.
The LTPs Units should address the interconnected competences as defined e.g. in the Green Comp Framework:

1. Embodying sustainability values
1.1 Valuing sustainability | 1.2 Supporting fairness | 1.3 Promoting nature
2. Embracing complexity in sustainability
2.1 Systems thinking | 2.2 Critical thinking | 2.3 Problem framing
3. Envisioning sustainable futures
3.1 Futures literacy | 3.2 Adaptability | 3.3 Exploratory thinking
4. Acting for sustainability
4.1 Political agency | 4.2 Collective action | 4.3 Individual initiative

See GreenComp for details

3 BUILD NETWORK AND GROW EXPERTISE

See what resources are available and could support your LTP (teaching-learning materials, etc.).
Network with colleagues and partner institutions regionally and nationally.
Describe possible collaborations with the 'world of work'.

4

LEARNER CENTERED & INCLUSIVE
REFLECTION FOR ACTION
TRANSFORMATIVE
COLLABORATIVE PRO TS
FUTURE WORKSHOP
DISCUSSIONS
REFLECTION
RESEARCH & ANALYSI
TEACHING SUSTAINABILITY
ACTION-ORIENTED
ENTREPRENEURIAL
HANDS-ON
REINFORCING COLLABORATION
INTERDISCIPLINARY
EXPLORATIVE LE
VISIONS-ORIENTATED
PARTICIPATIVE

5 DO IT! HAVE FUN! DISCUSS! BE CREATIVE!

6 REFLECT

In Education for sustainability assessment is multifaceted, and primarily encourages reflection ifor action and future- oriented aimed to raise questions and practise a critical perspective.

There is no ONE right answer! Give TS an important place in curricula and implement credits, badges or awards for it.

7 SHARE

Publish and share your materials under a Creative Commons license as open access. Because that is sustainable!

Link to GreenComp:
https://publications.jrc.ec.europa.eu/repository/handle/JRC128040

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?

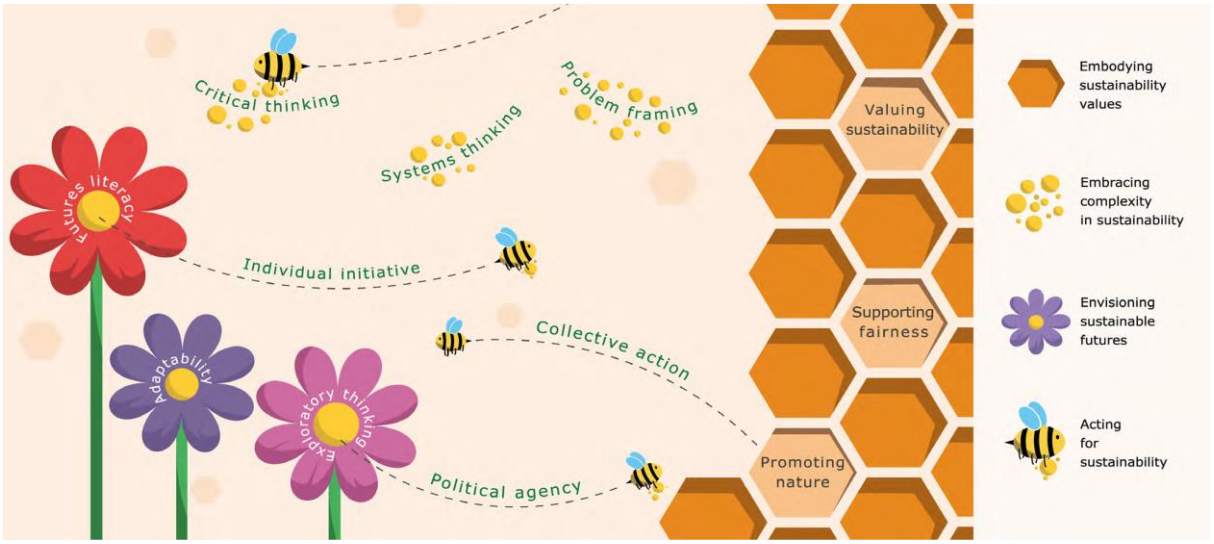
6. ASSESSMENT

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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