



SUSTAINABILITY AND DIGITALITY

Learning and Teaching Package 2

UNIT 1: THE RELATIONSHIP BETWEEN DIGITALITY AND SUSTAINABILITY

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Overview

The Learning and Teaching Package 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.

The present Unit introduces basic knowledge about the relationship between digitality and sustainability. The aim is to understand which ecological, economic and social challenges the digital world poses from a global perspective. But technologies have always been instruments of world measurement, also of world exploration, and thus can make a significant contribution to mitigating the climate crisis. To understand these interrelationships, the terms sustainability and digitality are defined first. Participatory exercises are part of the unit, as well as introductory materials for students and teachers.

Unit 2 invites to look at the complex relationship through the technology we use on everyday basis. The focus is first on the phone, then on the whole world and finally on one's use of technology. The smartphone is our constant companion. But what is a smartphone made of, where do its parts come from and where does a phone end up after its use? The activities in this unit closely follow the life cycle of a smartphone and introduce questions about individual media use in terms of sustainability: What can I do to make my media use more sustainable? What is the average usage time of a smartphone? Would it help if I did not buy a new smartphone every two years? What can I do with my old phone?

Unit 3 attempts to vividly convey the unwieldy topic of post/-colonial relations. This is done with interdisciplinary references including the integration of artistic works. This is also done by working with different materials and the - hands-on - representation of digital connectedness across the globe.

Unit 4 has a clear focus on questions about the future. The focus is *on raising ideas, questions, concepts*, etc. oriented towards existing theories on developments in the IT sector. Participants are confronted with the following questions: In which future do you want to live in, considering 'the needs of the present without compromising the ability of future generations to meet their own needs' (United Nations, 1987)?

Each Unit includes a [Follow-Up Activity](#) for teachers to reflect on their practice in view of integrating the topic of sustainability into their practice, [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

Unit 1 starts by explaining scientific findings and making them easily accessible (by learning videos and interactive images). This should provide learners with a level of expertise and to guide them towards further research. This should make clear that research is always a discourse. *There can never be one right answer, but many questions will be raised.*

[The participants](#), and learners are encouraged to reflect on their role within the subject area and to experience the topics of digitality, environment and sustainability in a hands-on way through real-life experiments with digital devices in a face-to-face setting. For this we use sensors of smartphones as well as smartphone microscopes to explore the natural environment with digital devices.



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 exercises and examples in this Unit were trialed as part of an "Active Learning Event" 1 (ALE) in both an online and offline format. In addition, the materials were used and improved several times in workshops at Partner universities. The materials are arranged [in a Moodle course](#) that is guides through Unit 1 from start to finish.



UNIT 1. Overview

Main Topic	Target Group	Duration	Knowledge Area/ Subjects in School	Activities	Suggestions for Possible assessment
Introduction to the central terms and arguments such as digitality and sustainability/sustainable development	Pre- and Inservice-Teachers for students (6-10y), some materials for students in school (6-10y)	Min 195 min	Science (Biology, Physics, Geography), Media Education	<p>Start-Up Activity1: What is Sustainability? Activity 2: What is Digitality? Activity 3: The relationship between digital technology and sustainability</p> <p>Development: Explore the environment with your smartphone</p> <p>Consolidation: Influence of digital technologies</p> <p>Follow-Up: Activity1: Sharing Experience Activity2: Reflection on teacher practice</p>	<p>Quiz on definitions of sustainability and digitality</p> <p>Documented Self-reflection</p>
Intended Learning Outcomes	<p>Having worked through the activities and materials, students will be able to:</p> <ul style="list-style-type: none"> ✓ Define the terms digitality and sustainability in their diversity and use them in conversations. ✓ Describe ecological, social and economic impacts of digital technologies on the basis of scientific findings. ✓ Build up a basic knowledge of the importance of digital technologies for the study of natural phenomena and use it for educational practice. ✓ Find and adapt further information and integrate it into their own teaching. ✓ Use the acquired knowledge for school and extracurricular projects. 				
Prior Competencies	<p>Obligatory:</p> <ul style="list-style-type: none"> • nothing <p>optional/ideal:</p> <ul style="list-style-type: none"> • An initial introduction to the terms sustainability and digitality is useful. • A first introduction with regulations and provisions on sustainability by the European Commission is useful. 				



Required materials	<ul style="list-style-type: none"> • Smartphone or Tablet • Paper and Pencil • Smartphone Microscope • APP: phyphox • APP: BookCreator 	
Cooperation/ Networking	<ul style="list-style-type: none"> • Public STEM research facilities for children (for Austria: https://www.science-center-net.at/, especially Knowledgeroom Vienna: https://www.science-center-net.at/type-projekte/wissensraum-english/) 	
Practical Notes for Teachers	Some materials, quizzes, interactive boards are located on the TAP-TS platform, in a Moodle Course. Make sure that you log in as a guest first to be able to access those - https://tap-ts.eu/course/view.php?id=12	
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.
	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.
		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.
		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.
		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

Estimated
Duration



The aim of the start-up activity is to provide an introduction to the concepts of sustainability and digitality. Students should also be able to understand the relationship between sustainability and digitality.

60 min




Activity 1: Sustainability

The materials provided are intended to give students a brief overview of the concept of sustainability.

Preparation for Activities: This activity can be carried out both individually and in groups.

A Note for a Teacher: Here you will find [further teaching and learning materials](#)  as well as [texts to discuss the content](#) .

Description



1.  Show [the interactive content of "Sustainability"](#) to the students. Give the students time to look at all the interactive contents of the graphic.
2.  The students should enter all important terms and concepts [in the glossary](#)
3.  Then let the students do the [quiz on "Sustainability"](#)

20 min

Activity 2: Digitality









The materials provided are intended to give students a brief overview of the concept of digitality.

Preparation for Activities: This activity can be carried out both individually and in groups.





A Note for a Teacher: Here you will find [further teaching and learning materials](#)  as well as [texts to discuss the content](#) .

20 min










	Description <ol style="list-style-type: none"> 1.  Show the students the Video about “Digitality” 2.  The students should enter all important terms and concepts in the glossary 3.  Then let the students do the quiz on “Digitality” 	
Activity 3: The relationship between digital technology and sustainability The materials provided are intended to give students a brief overview of the relationship between digital technology and sustainability.	<p>Preparation for Activities: This activity can be carried out both individually and in groups.</p> <p>A Note for a Teacher: Here you will find further teaching and learning materials  as well as texts to discuss the content .</p>	20 min
	Description <ol style="list-style-type: none"> 1.  Show the students the Video about “The relationship between digital technology and sustainability” 2.  The students should enter all important terms and concepts in the glossary 3.  Then let the students do the quiz on “The relationship between digital technology and sustainability” 	







Development		Estimated Duration
<p><i>In order to understand the complex relationship between digital technologies and sustainability not only in theory, it is useful to experience it in practice. To do this, students should discover the environment with the help of digital technologies.</i></p> <p><i>The instructions contain an explanation of the essential steps, tips on the necessary materials and didactic advice. A worksheet is provided for this task and is also freely available as OER (CC licence) and in an editable format (PPTX). The workshop activity focuses on exploring the environment with smartphones.</i></p>		90 min
<p>Activity 1. Explore the environment with your smartphone</p> <p>The aim is to make it tangible that the perception of nature always takes place with the help of media and technologies.</p> <p>GreenComp: 1.1 Valuing sustainability; 1.3 Promoting nature; 3.3 Exploratory thinking</p>	<p>Preparation for Activities: Make sure you have all the necessary materials for the activity (see worksheet in the Handouts, or on the platform. You will have to log in as a guest first).</p> <p>A Note for a Teacher: Make sure in advance that all groups have a smartphone with the APP phyphox and Plantnet.</p>	90 min
	<p>Description</p> <ol style="list-style-type: none">  Have the students get together in a research group of 3 to 4 people.  Hand out Worksheet: Explore the environment with your smartphone (also in Handouts) to the students.  Show the students the interactive picture of the smartphone sensors. Let the students find and discover the sensors on their smartphone. The students should also familiarise themselves with the phyphox app . 	






- | | | |
|--|---|--|
| | <ol style="list-style-type: none">4.  Hand out the smartphone microscopes to the students. Each group is given a smartphone microscope. The students should familiarise themselves with the smartphone microscopes.5.  The students familiarise themselves with the BookCreator app and the Plantnet app.6.  The students should explore the environment in their groups using the APPs and the smartphone microscope. In doing so, the students should create photos, videos, audio recordings, etc.7.  With the collected materials, each group will create an EBook on the topic: "Research Report: Our Environment Digitally Explored". Here  , you can find an example of an eBook.8.  Each group should present their EBook.9.  The students should then discuss their experiences. | |
|--|---|--|



Consolidation		Estimated Duration
<p><i>After exploring the environment with their smartphones, the students should walk through the environment with their eyes open. The aim is for them to consciously recognize the influence of digital technologies on their environment.</i></p>		30 min
<p>Activity 1. Influence of digital technologies</p> <p>The aim is to collaboratively experience the environment and to transfer the information from this unit to one's own reality. This makes it possible to experience individual responsibility for sustainable development.</p> <p>GreenComp: 1.1 Valuing sustainability; 1.3 Promoting nature; 3.3 Exploratory thinking</p>	<p>Preparation for Activities: Before carrying out the activity, it should be decided in which format the impressions are to be collected. It is possible to collect them with an online tool such as taskcards, but analogue media such as posters are also possible.</p> <p>A Note for a Teacher: This activity can be carried out in both individual and group work.</p>	30 min
	<p>Description</p> <ol style="list-style-type: none">  Tell the students on which medium the experience should be shared. Make sure that all students have access to it. You can use a digital pinboard , for example.  Give the students the following assignment: You should walk through the world with open eyes and document the influence of digital technologies. To do this, you can share photos or descriptions of e.g. mobile phone masts, cables, sensors in public spaces, etc.  Discuss the results together in plenary. 	



Follow-Up		Estimated Duration
<i>The aim of the follow-up activity is for the participants to gather and share their experiences of the experiment.</i>		15 min
Activity 1. Sharing your experience The aim is to share the experiences made and exchange ideas together. This enables a joint exchange of knowledge. GreenComp: 1.1 Valuing sustainability; 2.2 Critical thinking	Preparation for Activities: Before carrying out the activity, it should be decided in which format the experience are to be collected. It is possible to collect them in an online tool such as taskcards, but analogue media such as posters are also possible. A Note for a Teacher: This activity can be carried out in both individual and group work.	15 min
	Description 1.  Share your experience with the experiments in a digital pinboard  . 2.  What did you like? Where did you encounter difficulties? What new things did you discover?	



Activity 2. Reflection on teacher practice

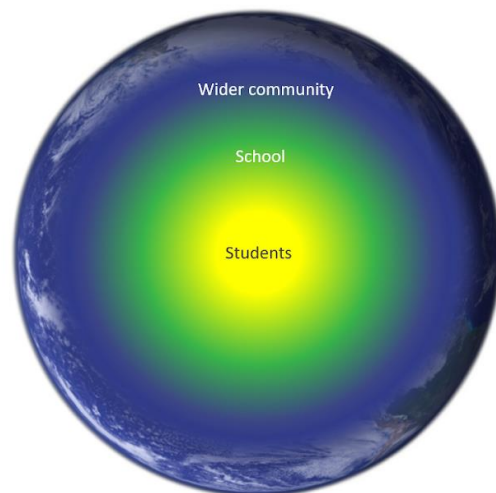
This is an activity aimed at helping reflection (individually and/or with colleagues) on how the previous activities contribute to developing sustainability competences and acting in a more sustainable way.



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.



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?



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



- Taking a picture

Glossary

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

Participants

Participants are the pre- and in-service teachers, teacher educators who are readers of the current documents.



Worksheets and Links

Start-Up

Activity 1. What is sustainability?

- [the interactive content of “Sustainability”](#) 

Activity 2. What is digitality?



- [Video about “Digitality”](#) 

Activity 3. The relationship between sustainability and digital technology

- [Video about “The relationship between digital technology and sustainability”](#) 

Development

Activity 1.

- **Worksheet:** [Explore the environment with your smartphone](#) , also in handouts
- [An example of an eBook](#) 

Suggested Apps

- BookCreator: <https://bookcreator.com/>
- Plantnet: <https://identify.plantnet.org/>
- Taskcards: <https://taskcards.eu/>
- Phyphox: <https://phyphox.org/>

Additional Links

- Here you can find the [GreenComp](#) as download.
- On the website [sustainablelifestyleseducation](#) you will find various teaching materials on the topic of sustainability and the Sustainable Development Goals.
- [WWF](#) offers you various resources for the classroom on the topic of sustainability on its website.
- [Sustainable Schools NSW](#) is managed by the Australian Association for Environmental Education NSW. This website also offers you various materials on different topics related to sustainability.
- [On the Platform you can find more useful resources and scientific articles.](#)



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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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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