



SUSTAINABILITY AND DIGITALITY

Learning and Teaching Package 2

Overview of LTP 2

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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.

Unit 1 Introduction to Sustainability and Digitality 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 My Smartphone. Planet Earth and Me shows how closely our daily companion is linked to the topic of sustainability. Various questions are raised based on the life cycle of a smartphone: What components does a smartphone consist of and what raw materials does it require? In which regions of the world are these raw materials mined? How long is the average useful life of a smartphone and how can old devices be reused or recycled in a meaningful way? The unit encourages critical analysis in order to make our own media behaviour more conscious and sustainable.

Unit 3 The Digital Technology Network on the Globe deals with the complex interactions of digitalisation from a global perspective. In this unit, various physical and digital world maps are used to illustrate the global impact on natural resources. Participants explore where undersea cables run and learn about the concepts of the ecological footprint and handprint. The growing amount of electronic waste is also used to address the global imbalance brought about by the digital transformation.

Unit 4 With or Without Technology 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.

The activities in Unit 2 provide knowledge based on scientific evidence from an interdisciplinary research perspective. Students are encouraged to reflect on their own role in the field and to experience the topics of digitality, the environment and sustainability in a hands-on way, for example by disassembling real-life digital devices to see what is “inside the box”. The topics and tasks are chosen in such a way that it becomes clear that the aim is to deal with

questions about future and alternative forms of action. The activities of this unit aim to enhance students' and school students' exploratory thinking, exploring and use of various disciplines, using creativity and experimentation. The activities engage students and school students in teamwork and encourage them to take different roles.

Unit 3 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.

Unit 4 starts with a video that introduces current issues in the field of digital developments. Terms explained in this video include robotics, artificial intelligence and digital capitalism. The video refers to issues of social, environmental and economic sustainability. In addition, further sources are provided. In a future workshop ('Zukunftswerkstatt'), the participants are encouraged to sketch possible future developments of one or more trends discussed in the video in teams. The aim is not to draw future scenarios that are as realistic as possible. It is about imagining a version of the future that is as dystopian or utopian as possible, as well as discussing the question of whether or not such a future will come to pass. At the end of the unit the groups present their ideas of a future to each other. As a conclusion, a joint statement is drafted and published summarizing these actions.

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 the LTP were trialed as part of Active Learning Events (ALE) in both an online and offline format; and Summer Schools. In addition, the materials were used and improved several times in workshops at Partner universities. The materials are arranged in a Moodle course that guides through Units from start to finish, with suggested literature to study.

ECTS Distribution

UNITS	Hours	ECTS
UNIT 1. INTRODUCTION TO SUSTAINABILITY & DIGITALITY	5	0,25
UNIT 2. MY SMARTPHONE. PLANET EARTH AND ME	5	0,25
UNIT 3. THE DIGITAL NETWORK ON THE GLOBE	10	0,5
UNIT 4. WITH OR WITHOUT TECHNOLOGY	10	0,5
		1,5

*Taught plus personal learning follow-out



UNIT 1. INTRODUCTION TO SUSTAINABILITY AND DIGITALITY

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?</p> <p>Activity 2: What is Digitality?</p> <p>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. 				



	<ul style="list-style-type: none"> 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 Knowledge room 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 2. MY SMARTPHONE. PLANET EARTH AND ME

Main Topic	Target Group	Duration	Knowledge Area/ Subjects in School	Activities	Possible assessment
Understanding the materiality of digitality, using the example of a smartphone	Pre- and in-service teachers, materials are provided for pupils in school (adaptable for 6-14y.o.)	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:	Start-Up Activity: The Life Cycle of a Smartphone. Development Workshop 1: Unblack the Box!	a suggestion for a project work; reflective questions



		Extra time is dedicated to reflections on teacher practice	<ul style="list-style-type: none"> ✓ (Digital) media education ✓ Geography ✓ Technics and Arts ✓ STEM subjects 	<p>Workshop 2: What's Inside Your Phone?</p> <p>Workshop 3: Pin the Planet!</p> <p>Workshop 4: From Trash to Treasure!</p> <p>Consolidation</p> <p>Activity 1: My Smartphone and me.</p> <p>Activity 2: Phone of the Futu.re</p> <p>Follow-Up</p> <p>Activity 1: Reflection for Actions</p> <p>Activity 2: Reflection on Teacher Practice</p>	
Intended Learning Outcomes	<p>Having worked through the activities and materials, students will be able to:</p> <ul style="list-style-type: none"> ✓ Reflect on their own media use regarding a more sustainable development. ✓ Name individual phone parts and what they are for ✓ Discuss the notion of “conflict materials”. ✓ Name precious materials in smartphones and where they come from. ✓ Discuss the concept of “upcycling”. ✓ Assess their own impact on a more sustainable development in the context of broader social and capitalist developments. 				
Prior Competencies	optional/ideal: Unit 1. Relationship between Digitality and Sustainability				
Required materials	<ul style="list-style-type: none"> • Digital devices no longer in use / discarded smartphones • Various tools or mobile phone repair kit (see iFIXIT, https://de.ifixit.com) • Materials to download - / Downloadable materials and crafts 				
Cooperation/ Networking	<ul style="list-style-type: none"> • Local repair café or mobile phone repair shop • Recycling collection centre • school/college/educational institution (e. g. for collecting mobile phones) • NGOs with mobile phone collection campaign (e. g. Jane Goodall Institute) 				
Practical Notes for Teachers	The timing given at the beginning is meant for orientation. The Unit materials can be used as a monthly project, or one long workshop. Activities can be adjusted to suit the timing of the project or workshop. Most parts of this LTP are designed for teaching the last year of primary level, some parts are rather suitable for teaching at secondary level. One will need to adapt the materials to the age group/ level of class.				
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.		
		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.			



	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.
	4.3 Individual initiative	To identify own potential for sustainability and to actively contribute to improving prospects for the community and the planet.

UNIT 3. THE DIGITAL NETWORK ON THE GLOBE

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 300 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: <ul style="list-style-type: none"> ✓ (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 Follow-Up Activity 5. Ecological / Climate Handprint Project Journey 2. Mapping Digital Technology Start-Up Activity 1. What do you see?	Project work



				<p>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</p>
Intended Learning Outcomes	<p>Having worked through the activities and materials, students will be able to:</p> <ul style="list-style-type: none"> ✓ Reflect on digital connectedness across our globe. ✓ Discuss the concept of “Carbon Footprints”. ✓ Know which countries are the top CO2-producing 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	<p>optional/ideal: Unit 1 – Relationship between Digitality and Sustainability and / or Unit 2 – My Smartphone, Planet Earth and Me</p>			
Required materials	<ul style="list-style-type: none"> • Illustration of a world map on paper (e. g. DIN A3) or carpet with a world map • Cords, pencils, wooden blocks... 			
Cooperation/ Networking	<ul style="list-style-type: none"> • 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	<p>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.</p> <p><i>We also advise to look at LTP 3 Environmental Sustainability Unit 4 My Actions for Energy Saving.</i></p>			
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.		



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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 4. WITH OR WITHOUT TECHNOLOGY?

Main Topic	Target Group	Duration	Knowledge Area/ Subjects in School	Activities	Suggestions for assessment
Knowledge about future developments in the IT sector and ideas for a more sustainable development	Pre- and Inservice-Teachers for students (6-10y)	195 min.	<ul style="list-style-type: none"> - (digital) media education - Informatics - Ethics - Politics 	<p>Activity 1. Introductory video – A Future with or without Technology?</p> <p>Activity 2. A Future with or without Technology?</p> <p>Activity 3: OUR RESOLUTION</p> <p>Activity 4: FINAL RESOLUTION</p> <p>Activity 5. Reflection on teacher practice</p>	Workshop-Documentation and Reflection Discussion Co-Creation (written statement)
Intended Learning Outcomes	<p>Having worked through the activities and materials, students will be able to:</p> <ul style="list-style-type: none"> ✓ Define current concepts on developments in the IT sector and enter not a discussion about them. ✓ Work with others on future concepts and outline developments. ✓ Define and argue measures for a more sustainable development in the IT sector. 				
Prior Competencies	obligatory: Unit 1, 2 and 3 from LTP 2				
Required materials	<ul style="list-style-type: none"> • Pen and paper • Laptop / Smartphone / Laptop 				



	<ul style="list-style-type: none"> • Booklet: A Future with or without Technology? 	
Cooperation/ Networking	For more insight, it is worth cooperating with museums on digitality and art (in Austria e.g. Ars Electronica Center, https://ars.electronica.art/news/de/) or with non-university and extracurricular partners with a focus on global learning and digitality.	
Practical Notes for Teachers	Some materials, vidoes, interactive boards are located on the TAP-TS platform, in a Moodle Course. Make sure that you log in first to be able to access those - https://tap-ts.eu/course/view.php?id=12	
Addressing GreenComp	Embodying sustainability values	
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Project partners

