



USING SERIOUS GAMES TO TEACH SUSTAINABILITY & RESILIENCE

Learning and Teaching Package 4

Unit 1

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Overview

USING SERIOUS GAMES TO TEACH SUSTAINABILITY & RESILIENCE offers an introduction to key pedagogies and the learning possibilities of using ‘serious games’ for education and engagement around sustainability. ‘Serious games’ can be understood as games that focus toward problem-solving and awareness raising rather than entertainment and use features and characteristics of games and game-play to encourage learning and engage the learner in ways that open up challenging and complex issues in a meaningful and non-threatening way. Key elements of engagement such as meaning, ownership, social influence, achievability, challenge, and credibility enhance the success of gamification platforms. The unit explores how these can be incorporating into classroom game designs and activities and so strengthen participants’ learning engagement. Uses explored in the Unit include awareness raising, encouraging action and resilience, and promoting pro-sustainability behaviours.

Pedagogical Approach

The pedagogical approach behind integrating serious games and role plays in an educational activity is rooted in the principles of experiential learning and active engagement. By incorporating serious games, learners are immersed in a dynamic and interactive environment that stimulates critical thinking and problem-solving skills. The use of role plays adds a layer of realism, allowing participants to apply theoretical knowledge in practical scenarios. The teaching content is presented in a way that makes abstract and complex concepts more relatable to students, which contributes to better understanding and retention of knowledge.

Sustainability & Resilience: why they matter

Encouraging young people to study issues like sustainability, resilience and climate action is crucial to their education as informed and active citizens in a fast-changing world. It provides them with essential insights into sustainable living and promotes critical thinking and problem-solving skills. Understanding the interconnected nature of sustainability and resilience provides a holistic perspective for making informed decisions. Education on these issues empowers youth people, preparing them for the future with adaptability and sustainability in mind. It also fosters environmental and social responsibility, so shaping a more informed and proactive global citizenry. In summary, engaging with these topics equips young individuals to contribute to a more just, more sustainable and more resilient world

Piloting of the Unit materials within TAP-TS

The central ideas and approach were designed in cooperation with a group of UCD student teachers from the PME (Professional Master’s in Education) secondary teacher education programme in autumn 2022. Draft materials and activities were tested with another PME group in autumn 2023. A final validation check took place in Oct 2024 when the materials for this Unit were explored by a group of participants at an ECPR Teaching Methods School in Maastricht, The Netherlands.



USING SERIOUS GAMES TO TEACH SUSTAINABILITY & RESILIENCE

Unit Overview

Main Topic	Target Group	Duration	Knowledge Area/ Subjects in School	Activities	Possible assessment
Approaching teaching & learning for sustainability through serious games; an introduction.	Teachers / student teachers with an interest in educational gaming as a pedagogical strategy.	Class time: 2 x 45 mins. Learner preparation & follow-out: 7 hours	1: Sustainability & climate action. 2: Politics & Society	Activity 1 Defining sustainability Activity 2 Characteristics of a teaching game Activity 3 Game Design Activity 4 Gamemaking Activity 5 <i>Reflection on teacher practice</i>	Teacher determined. Could include an action project / game making on (un)sustainable development or climate change.
Intended Learning Outcomes	<p>By working through the activities and materials, students will:</p> <ul style="list-style-type: none"> • D2.4/1/LO1: Explore the wholistic nature of strong learning for sustainability in school teaching & learning setting. • D2.4/1/LO2: Examine the characteristics of strong games for teaching & learning on sustainability and resilience; to include understanding the range of possibilities and the limitations of using games with young adult learners. • D2.4/1/LO3: Develop an understanding of how using and making games can be a valuable way to learn for sustainability and resilience in classroom settings. 				
Prior Competencies	<p>Obligatory:</p> <ul style="list-style-type: none"> • No prior competencies required. <p>Optional/ideal:</p> <ul style="list-style-type: none"> • Digitally capable of meaningful engagement with lesson materials and sources. • Collaboration and cooperation skills to support group activities and agreed solutions. 				
Required materials	<p>Access to online prompts for Activity 2 (or downloaded alternative). Access to printouts / digital copies of unit worksheets and resources</p>				
Cooperation/ Networking	<p>The unit could facilitate contacts with agencies and organisations with an interest in developing / using educational/ serious games.</p>				
Practical Notes for Teachers	<p>The learning materials and approaches presented in this unit are in four activity blocks directed at learners / participants; timewise, these can easily be adjusted depending on time available and the teaching needs of the group. For example, Activity 3 could easily be extended to fill a full teaching session and Activity 4 could be the source of an individual / collaborative after class challenge or homework assignment. Activity 5 relates to teacher reflection and is intended to facilitate and support teacher learning.</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.
	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


Start-Up







<p><i>Introduces the concept of sustainability and sets the tone and direction for the rest of the activities.</i></p>		<p>Estimated Duration</p>
<p>1: Assembling a Sustainability Bicycle: the components of sustainability.</p> <p><i>GreenComp engaged:</i> 2.2 critical thinking, 2.3 problem framing, 2.1 systems thinking, 4.2 collective action,</p>	<p>Preparation for Activity: prepare;</p> <ul style="list-style-type: none"> - Large printed image of a bicycle or a simple whiteboard diagram of the model. - <i>Resource 1.</i> Small paper cutouts representing each "part" of the bicycle model: wheels (knowledge/thinking skills), frame (identity/values), chains and pedals (action), saddle (motivation), brakes (barriers), lamp (hope/emotions), handlebar (future orientation). <p>A Note for the Teacher: The lesson opens by introducing the learners to the ‘components’ of sustainability (knowledge, action, emotions, future orientation, etc.) using a bicycle metaphor. This is a hands-on and helpful activity that encourages students to reflect on their own views and identify which elements they feel are crucial for climate action. It is based on the original idea and materials developed by Cantell to teach the concept of climate action.</p>	<p>15 min</p>



<p>3.3 exploratory thinking and 4.3 individual initiative</p>	<p>Description</p> <ol style="list-style-type: none">  Ask volunteer(s) to describe a bicycle and explain how it works.  Briefly explain that sustainability is like riding a bicycle—each part helps us move forward and handle obstacles. Highlight that <u>understanding</u>, <u>motivation</u>, and <u>taking action</u> all play key roles.  Pairs-Discussion: Divide students into small groups and hand each group one or more of the paper cutouts representing a part of the bicycle. Ask them to discuss: <ul style="list-style-type: none"> - Why they think this part might be essential for addressing sustainability. - Examples of how this part relates to sustainability or understanding sustainable actions.  Group Activity: Assembly and Reflection: <ul style="list-style-type: none"> - Invite groups to come up and place their parts on the board/paper to "assemble" the bicycle. - As each part is added, have one student briefly share a thought or example they discussed.  Suggest that just like every part of a bicycle is needed to ride smoothly, all these elements—knowledge, values, action, motivation, hope, and planning—are essential in adopting sustainable life choices and related action. This model helps us see sustainability as a complex issue that we can approach from multiple perspectives. 	<p>2mins</p> <p>5mins</p> <p>3mins</p>






Development		Estimated Duration
<p><i>Introduce learners to the characteristics of effective educational games by guiding them to identify what makes games both fun and educational.</i></p>		
<p>2: GameStorming: Exploring what makes a learning game fun</p> <p><i>GreenComp engaged:</i> 1.1 Valuing sustainability 2.2 Critical thinking 3.1 Futures literacy, 3.2 Adaptability, and 3.3 Exploratory thinking</p>	<p>Preparation for Activities: Resources needed</p> <ul style="list-style-type: none"> • Large paper or whiteboard • Markers or sticky notes • Copies of resources noted in the lesson scenario; GameStorm Deck and GameCards. 	30mins
	<p>Description</p> <ol style="list-style-type: none">  Opening Discussion: <ol style="list-style-type: none"> Ask the group to think of a favourite game they've played recently (educational or otherwise). Pose two questions: <ol style="list-style-type: none"> "What made the game fun or exciting?" "What did you learn or practice while playing it?" Capture their answers on the white board. Look for words like "enjoyable", "challenging," "rewarding," "creative," or "teamwork." <p>Some Key Characteristics: Briefly discuss a few main characteristics of good educational games:</p> <ol style="list-style-type: none"> Engagement: Games should be enjoyable and hold attention. Things you find out: There's something specific to learn, or do, or practice. Giving / Getting Feedback: Players know how they're doing and can improve. 	<p>10mins</p> <p>5mins</p>








	<p>d. Why we play: The game offers challenges, goals, and/or obstacles - and feel rewarding.</p> <p>e. Choice & Exploration: Players can make choices that change what is happening in the game.</p> <p>Write these on the board for reference.</p> <p>3. The <i>GameStorm</i> Challenge:</p> <p>a. Divide the group into pairs or small teams; ideally three or max four.</p> <p>b.  Challenge each team to come up with an idea for a game based on one or two of the characteristics discussed above. The topic must be about sustainability or climate action. They can come up with their own idea OR select one from the <i>GameStorm Deck</i>. (Resource 2)</p> <p>c.  Have them jot down a name and their game idea in a few short sentences on sticky notes / <i>GameCard</i> (Resource 3) to add to the class collection.</p> <p>4. Sharing & Pitching</p> <p>a.  Each team briefly shares their game concept and adds their <i>GameCard</i> or notes to the class collection (whiteboard or poster).</p> <p>b.   Give <i>2Stars + 1 Wish</i> Feedback on one or more of the ideas put up by other teams.</p> <p>c.  As a full-group, discuss which <i>characteristics</i> each game idea includes – emphasising what makes the game engaging and worth playing. Emphasis also the idea of the <i>simple rules</i> rule, and the need for a game to be enjoyable and – ideally – suitable for a group to play.</p>	<p>10mins</p> <p>10mins</p> <p>5mins</p>
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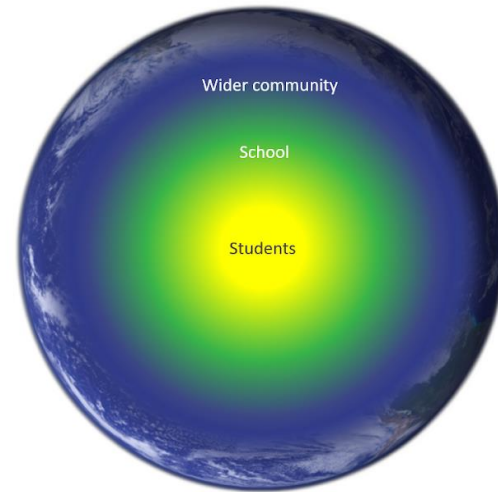
Consolidation

<p><i>Running an in-class workshop on prototyping sustainability and resilience games can be an engaging, hands-on way to help learners develop creative solutions for real-world problems and learn more about sustainability.</i></p>		<p>Estimated Duration</p>
<p>3: Making it ‘real’: from idea to prototype</p> <p>GreenComp engaged: 1.1 Valuing sustainability 2.2 Critical thinking 2.3 Problem Framing, and 3.3 Exploratory thinking</p>	<p>Preparation for Activities: Basic materials to make board game or card-based games in class contexts:</p> <ul style="list-style-type: none"> - Large sheets of paper or poster boards. - Markers, coloured pencils, sticky notes, and sticky notes / index cards. - Game pieces / small objects or strong card to make pieces (e.g., tokens, dice) for gameplay. - Prompt cards for sustainability topics (Resource 4) and Guidance on Planning a Game (Resource 5). - Timer to keep activities on schedule. <p>A Note for a Teacher: This activity would ideally be the basis of a second lesson but will work in a shortened form (depending on time available) as a continuation of the previous activity if included in homework aspects</p> <p>If it is a follow-up lesson, open with a short recap of the previous activities – emphasis especially the characteristics of a good game, the <i>simple rules</i> rule, and the need for it to be enjoyable and – ideally – for a group to play. A key point is to focus on Focus on Learning, not perfection. Emphasize that prototypes don’t have to be polished / ‘finished’ in every detail. The focus is on communicating ideas and providing enjoyable learning opportunities for your players.</p>	<p>45- 90min</p>




	<p>Description</p> <ol style="list-style-type: none"> 1.  Organise that learners rejoin or remain in the groups that developed the basic ideas shared at the end of the previous activity. Ask them to review their proposals. 2. Introduce the PBT Three-Steps Process to the class and explain how this works; Plan-Build-Test. Explain the two Golden Rules: keeping it simple and building the game for <i>good-enough to show potential</i> rather than <i>'perfect'</i>. <i>Make Resource 5 available</i> 3. Game concept and structure: <ol style="list-style-type: none"> a.  Ask the group to think of what they want the game to look like and how it will work. b. Pose these questions about <u>the mechanics of the game</u>: <ol style="list-style-type: none"> i. <i>"What is the main point of your game?"</i> ii. <i>"Who are the player, and what roles do they take on (e.g., a city planner, a climate scientist, an animal rescuer...)"</i> iii. <i>"What are the main challenges, issues or obstacles that players will face and need to get past?"</i> iv. <i>"How will you build in opportunities to gain information and take actions on sustainability?"</i> <p>Make Resources 4 and 5 available in hard copy or digitally to help with this step.</p> 4. Making a basic prototype: <ol style="list-style-type: none"> a.  Ask each groups to put together a basic, low-fidelity prototype of their game. Encourage them to use paper, markers, and other materials to create a playable version of their game idea. This could be a board game, card game, or simple paper-based 'app' prototype. 	<p>5mins</p> <p>3mins</p> <p>20mins</p> <p>30mins</p>
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	<p> Suggest that each group needs to define: basic, player actions (what players can and cannot do each turn), the rules of their game (kept simple and very few), and how players will know they are succeeding in the game. (Recommend that they Use Resource 5 to help keep these in mind.)</p> <p>5. Playtesting and Feedback:</p> <p> Ask each group to nominate one member to move to another group for the next stage of the lesson.</p> <p> Each group takes 3-5 minutes to explain their game concept and rules to the new group member, who then playtests it with them. After playing for a few turns and reworking any really troublesome parts, each group shares their game with at least one other group in a <i>world café</i> way (if time allows) and gives each other some feedback on <u>clarity</u>, <u>level of interest/ engagement</u>, and <u>sustainability learning</u>. Otherwise the ‘new’ group member (or one of the others in the group) can give a brief report to the full class on their experience with the game they have play-tested.</p> <p>6. Close-out and reflection on learning: Ask the class to gather for a closing discussion. Lead a conversation on:</p> <ul style="list-style-type: none">  Challenges they faced and how they addressed these as they designed & built their games.  What they learned about sustainability through the game design activity?   Ideas they would like to keep developing – either as groups or one their own. 	<p>40mins</p> <p>10mins</p>
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Follow-Up		Estimated Duration
<p><i>Follow-up is helpful for learning purposes. The activities at 1 below are suggested for learners / students and those at 2 for their teachers – as part of a deliberative, self-study approach to professional learning.</i></p>		
<p>1. TAKING THINGS TO THE NEXT LEVEL: individual and/or collective further development of the game</p>	<p>Description</p> <ol style="list-style-type: none">   Situate the next-steps for the learners as an opportunity to develop further the work done so far on their game. This could be a short personal reflection on what they have learnt in written or digital media form. Or it could be a shared decision to refine and further-develop the game beyond prototype so that it can be stored and shared with others more easily.   Suggest that three steps might be taken: revisit and refine the idea and ‘mission’ behind the game; look again at the gameplay and see if it can be simpler and more fun; and how might the ‘pieces’ and ‘parts’ be improved? 	Open
<p>2. REFLECTION ON AND FOR PRACTICE: deliberative review</p>	<p> How can I mobilize the activities in my teacher practice?</p> <p> Please reflect on two or three of the following dimensions at three levels of engagement (students - teacher; school; and wider community and beyond):</p>	



Dimension 1. Learning objectives:

1.  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?
2.  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.
3.  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:

1. 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?
2. 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?
3. 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?
4. 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:

1. Can the previous activities contribute to all students' participation and learning? What actions can you take to ensure the learning of all students?
2. How have the activities contributed to engage with different perspectives to consider sustainability challenges and opportunities?
3. 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?



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?



Have the activities contributed to grasp connections and interactions between natural events and human actions?



Dimension 5. Digital resources and equipment:



1. Did you use of technology adequately support the activities you have selected and implemented from LTP materials?



2. Did you try to enable students to use resources for learning at school in a sustainable way?



3. 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?



4. Did the activities help them to think critically about information sources and communication channels on sustainability to assess the quality of the information they provide?



Dimension 6. Community involvement:



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



2. 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?
3. To what extent do the activities engage in democratic decision making and civic activities for sustainable development?

✓ **Dimension 7. Assessment and feedback:**

1. 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?
2. 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.
3. 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



Worksheets

Start-Up

Resource 1: 'Sustainability' Bicycle.

https://www.wwf.org.uk/sites/default/files/2020-05/Climate_Change_Education_Bicycle_Model.pdf

WWF

CLIMATE CHANGE EDUCATION BICYCLE MODEL

The worksheet features a bicycle-shaped template with various components labeled for cutting and assembly:

- Front Wheel:** Labeled "THINKING SKILLS"
- Rear Wheel:** Labeled "KNOWLEDGE"
- Seat:** Labeled "MOTIVATION PARTICIPATION"
- Pedal:** Labeled "ACTION"
- Frame:** Labeled "VALUES", "IDENTITY", and "WORLDVIEW"
- Handlebars:** Labeled "OPERATIONAL BARRIERS"
- Chainring:** Labeled "FUTURE ORIENTATION"
- Chainstay:** Labeled "HOPE EMOTIONS"

Source: Cantell, H. et al. 2019, 'Bicycle model on climate change education: presenting and evaluating a model', Environmental Education Research, vol. 25, issue 5.



Development

Resource 2: *GameStorm Deck*.

[Print and cut out before activity...]

<p>Carbon Footprint Challenge</p> <p>Think up a game that involves players by making sustainable decisions by calculating their daily carbon footprint and then making choices (e.g., transportation, food, energy use) to compete to reduce it. They can also “earn” bonus points through eco-friendly activities.</p>	<p>Biodiversity Rescue</p> <p>Think up a game that involves players having to navigate through ecosystems to protect endangered species, addressing threats like habitat destruction, pollution, and poaching. They should be able to “earn” points by restoring habitats and balancing species populations.</p>
<p>Climate Change Detective</p> <p>Think up an idea for a mystery-style game where players investigate the causes of climate change by analysing historical climate data, observing patterns, and solving puzzles. They should be able to make connections between human activities and environmental impact and earn points for suggesting ways to improve things.</p>	<p>Eco-Friendly City Builder</p> <p>Think up a game that means players have to design a sustainable city by balancing resources, reducing emissions, and managing waste. They should face challenges like population growth and extreme weather events and be able to learn about the complexities of urban sustainability. Bonus points for city-farms and circular economy activities.</p>
<p>Renewable Energy Race</p> <p>Outline a game where players compete to create an energy-efficient society, using solar, wind, and other renewables. They should face real-world challenges like energy demands, resource costs, and weather patterns to plan for sustainable energy production.</p>	<p>Ocean Cleanup Adventure</p> <p>Think up a game set in a polluted ocean environment, players must work to remove waste, clean up plastic, and protect marine life. They should gain points for activities that tackle pollution sources and the improve waterways and oceans. Bonus points for beach clean-ups.</p>
<p>Climate Crisis Simulation</p> <p>Players take on roles (scientists, policymakers, activists) in a climate crisis simulation, making decisions that impact the global climate. Each decision impacts variables like emissions, biodiversity, and social well-being.</p>	<p>Sustainable Farming Quest</p> <p>Players manage a farm while learning about sustainable agriculture practices like crop rotation, organic farming, and soil conservation. The goal is to maximize crop yield without harming the environment.</p>



<p>Waste Sorting and Recycling Champion Think up an idea for a fast-paced sorting game where players sort various types of waste (e.g., recyclable, compostable, landfill) under time pressure. They score points for correct sorting, encouraging understanding of waste reduction.</p>	<p>Climate Adaptation Survival Game Think up an idea for a game where players are in a community affected by climate-related events (like floods, droughts, or wildfires) and must make choices to adapt and protect their community. The challenges should involve taking actions for resilience and adaptation in the face of climate change.</p>
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Resource 3: *GameCard*; Worksheet for editing 

[Print or make digitally available during activity...]

Name of the Game:	
The Mission / Big Idea:	
How you play (arena, basic rules, moves etc.):	
How you earn 'points' / bonus points:	
Which 'characteristics' are you planning to address – and how:	
How do you 'win:	



Resource 4: Sources of starter-ideas for game content.

[Vetted sites to use to start 'researching for ideas to build their games around or into the game. Print as search terms or make available in digital copy.]

<p>Carbon Footprint Challenge What is a carbon footprint Conservation.org</p> <p>Top 10 tips to reduce carbon footprint revealed BBC</p>	<p>Biodiversity Rescue The Global Impacts of Habitat Destruction National Geographic</p> <p>How habitat conservation and restoration support better human health outcomes WWF</p>
<p>Climate Change Detective The Causes of Climate Change NASA Science</p> <p>What are the effects of global warming? National Geographic</p>	<p>Eco-Friendly City Builder Sustainable Cities United Nations Sustainable Development Action 2015</p> <p>What makes a city sustainable? United Nations Sustainable Development</p>
<p>Renewable Energy Race 7 Challenges For Renewable Energy Preventing Adoption TRVST</p> <p>Fossil fuels: Can humanity really kick its addiction? BBC</p>	<p>Ocean Cleanup Adventure Ocean Plastic Pollution Explained The Ocean Cleanup</p> <p>Ocean plastic: How tech is being used to clean up waste problem BBC</p>
<p>Climate Crisis Simulation Climate change fuelled extreme weather in 2023 World Weather Attribution</p> <p>Effectiveness of 1,500 global climate policies ranked for first time University of Oxford</p>	<p>Sustainable Farming Quest A beginner's guide to sustainable farming United Nations Environment Programme</p> <p>Sustainability in agriculture and rural areas through the common agricultural policy (CAP) European Commission</p>
<p>Waste Sorting and Recycling Champion The A-Z of waste My Waste</p> <p>Smart Waste Management Recycle Track Systems</p>	<p>Climate Adaptation Survival Game Mitigation and Adaptation MIT Climate Portal</p> <p>How to cool down cities and eliminate urban heat islands World Economic Forum</p>



Consolidation

Resource 5: Planning guidance for game design & development

PLAN

- What is the main point of your game?
- Who are the player, and what roles do they take on (e.g., a city planner, a scientist, an animal rescuer...)?
- What are the main challenges or obstacles that players will face?
- How will you build in information and suggestions for action on sustainability?



STORY & RELEVANCE

- What in the game will keep the players interested?
- How many of these can you see ways of building in to help your game?
 - a. Engagement: Games should be enjoyable and hold attention.
 - b. Things you find out: There's something specific to learn, or do, or practice.
 - c. Giving / Getting Feedback: Players know how they're doing and can improve.
 - d. Why we play: The game offers challenges, goals, and/or obstacles - and feel rewarding

MOVES & RULES

- What is your basic gameplay design? Card game, board game...
- What can players do in their turns?
- What are the basic rules they must follow?
- Individual / group options?
- How will a player know they are 'winning' making the grade on the challenges in the game?

PLANNING & FRAMING-UP YOUR GAME



Links

Consolidation

Resource 4: Sources of starter-ideas for game content

- [What is a carbon footprint | Conservation.org](#)
- [Top 10 tips to reduce carbon footprint revealed | BBC](#)
- [The Global Impacts of Habitat Destruction | National Geographic](#)
- [How habitat conservation and restoration support better human health outcomes | WWF](#)
- [The Causes of Climate Change | NASA Science](#)
- [What are the effects of global warming? | National Geographic](#)
- [Sustainable Cities | United Nations Sustainable Development Action 2015](#)
- [What makes a city sustainable? | United Nations Sustainable Development](#)
- [7 Challenges For Renewable Energy Preventing Adoption | TRVST](#)
- [Fossil fuels: Can humanity really kick its addiction? | BBC](#)
- [Ocean Plastic Pollution Explained | The Ocean Cleanup](#)
- [Ocean plastic: How tech is being used to clean up waste problem | BBC](#)
- [Climate change fuelled extreme weather in 2023 | World Weather Attribution](#)
- [Effectiveness of 1,500 global climate policies ranked for first time | University of Oxford](#)
- [A beginner's guide to sustainable farming | United Nations Environment Programme](#)
- [Sustainability in agriculture and rural areas through the common agricultural policy \(CAP\) | European Commission](#)
- [Smart Waste Management | Recycle Track Systems](#)
- [The A-Z of waste | My Waste](#)
- [Mitigation and Adaptation | MIT Climate Portal](#)
- [How to cool down cities and eliminate urban heat islands | World Economic Forum](#)

Additional Links

- *An excellent, short introduction to the principles of learning game design.*
5 Fundamental Principles for Developing Educational Games *Take Game-Based Learning to the Next Level* by Neil J. Lambert
<https://hbsp.harvard.edu/inspiring-minds/5-fundamental-principles-for-developing-educational-games>

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	<p>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:</p> <ul style="list-style-type: none"> 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	<p>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</p>
3: Networking & Bundle Expertise	<p>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.</p>
4: Working through the design process	<p>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.</p>
5: ASSESSMENT DESIGN	<p>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.</p>
6: PUBLISH TO TAP-TS PLATFORM	<p>Can you and where can you publish your materials under a Creative Commons license as free as possible. Because that is sustainable!</p>



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'.

ROADMAP Developing TAP-TS Materials



7 SHARE

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

6 REFLECT

In Education for sustainability assessment is multifaceted, and primarily encourages reflection for 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.

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



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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