EXAMPLE TRAIL Austria 1: Biodiversity of trees and their importance in the urban environment

Name of the trail:	Biodiversity of trees and their importance in the urban environment	
How to find it on Discovery Trail:	https://kool.avastusrada.ee/k/naturerlebnispark/dt-trees-short version/enter	
Screenshot:	<image/>	
Developer:	Silvia Grabner, David Grabner, Mario Trummer, Paul Leitgeb	
Addressed age group:	Grades 5–6	
Addressed dimensions of biodiversity:	Focus on trees as an example of species diversity and ecosystem diversity.	
Relevant topics:	Biodiversity of trees and their importance in urban life	

General overview and aim:	Gain a basic understanding of the complexity of an ecological system:
	 identify biotic and abiotic factors and their interrelationship with biodiversity analyse a local problem related to biodiversity, raise awareness of the importance of biodiversity in the environment of the participants, especially in urban areas investigate the living environment through research and reflect critically and constructively on the results become familiar with scientific working methods (selective mapping) recognise the significance of the selected environmental conditions for an ecosystem using the example of water/humidity learn the identification and comparison of characteristics through observation (different plant species/trees) analyse, compare, and interpret data and results of investigations and observations find solutions to personal contexts
Framework conditions:	Time: about 2 hours Equipment required: Mobile phones or tablets with internet access for all participants No essential prior knowledge is expected.
	The participants will be divided into four groups. One supervisor will guide each of the four groups for all tasks during the DT.
	Motivating framework (narrative, context): A framework story is used as motivation, in which the trees need to be investigated to analyse the meaning of trees for humans, other plants, and animals in the urban space.

Flowchart		
 1 Species and shape diversity of tree Activity 1.1: Characteristics of trees Activity 1.2: Identification of trees Activity 1.3: Tree numbers and tree checking: What does it mean? Activity 1.4: Find solutions in the context of everyday life 	 Activity 2.1: Activity 3.1: Estimation Activity 3.2: Investigation Activity 3.3: Reflection and discussions Activity 3.4: Find out what effects the results can have on your own natural environment Activity 2.4: Finding experiences that can be used in the everyday context 	
Modules of the trail		
Content 1 – Species and shape a	diversity of trees	
Activity 1.1 Decompising share	untervieties the interview traces	
Activity 1.1 – Recognising characteristics to identify trees Site conditions/information A location with different tree species (broad-leaved trees and conifers) to be able to identify tree species.		
Duration	5 minutes	
Description of the activity	Sitting under a tree, you have probably already noticed the differences and similarities between trees.	
	Question: Do you know which characteristics can be used to identify a tree species?	
	Answer format: multiple choice – A quiz is given to find the opportunities to identify the characteristics of a tree.	
Content 1 – Species and shape of	Content 1 – Species and shape diversity of trees	
Activity 1.2 – Identification of t	rees	
Site conditions/information	With the help of visual illustrations in the "Discovery Trail' the leaf structure, leaf arrangement, leaf margin and leaf shape of the trees growing here are analysed. The names of the trees	
	can then be determined using a process of elimination.	

Duration	15 minutes
Description of the activity	Question: Can you name a tree? Try to identify a tree by its leaves (Provided: the tree identification key)
	Answer format: free text – Each participant looks for a tree and tries to find out the name of the tree using the given guidelines and instructions in the Discovery Trail.
Content 1 – Species and shape a	liversity of trees
Activity 1.3 – Tree numbers and	tree checking
Site conditions/information	In the city of Graz, every tree that is planted in a public green space has a tree number that is fixed to the tree. These numbers are entered in a computerised register known as the tree register. The number can also be used to find out the name of the tree. Each tree is regularly inspected for damage to the roots, trunk, and crown and the results of the investigation are entered in the tree register.
Duration	10 minutes
Description of the activity	Questions: 1.3. Think about why you need regular tree inspections. 1.4. Find solutions in context of everyday life. Answer format: free text – Discuss your thoughts in the group and write down your thoughts.
Content 2 – Manning a tree avenue	
Activity 2.1 – Monitoring and counting	
Site conditions/information	The location must have a tree avenue with different tree species (can also be another area with different tree species). A habitat in a specific, limited area is to be recorded by conducting a mini biotope mapping.
Duration	10 minutes

Description of the activity	 Questions: How many trees are there in this avenue? = Total number of trees (Mini biotope mapping) How often can the most common tree species be found? = Number of the main tree species Which tree species occurs most frequently? All trees are counted. Different tree species are counted. The aim is to find out which tree species is most frequently found 	
	Answor format: froo toxt	
Content 2 – Mapping a tree avenue		
Activity 2.2 – Monitoring and ex	Activity 2.2 – Monitoring and exploring	
Site conditions/information	A tree offers valuable structures as a habitat for other organisms. Unusual growth forms, tree caves, niches and splits, trunk injuries, flaky bark with rotting spots, or decomposed wood offer retreats for very specific species.	
Duration	10 minutes	
Description of the activity	Question: Can you recognise any special structures on the trees in the avenue?	
	Answer format: photo – The trees are examined for special	
	structures and a photo is taken of the observation.	
Content 2 – Mappina a tree ave	nuo	

Activity 2.3 – Monitoring and evaluation	
Site conditions/information	Place for a group discussion
Duration	10 minutes
Description of the activity	Question: 2.3. Is this avenue of trees a high-quality environment for other organisms? 2.4. Finding experiences that can be used in the everyday context.
	Answer format: free text – Think about how these structures have developed on the tree and which organisms can live here. Discuss your thoughts in the group and consider together whether this avenue is a valuable habitat. Write down your reasons for the decision.

Content 3 – Trees and water	
Activity 3.1 – Estimation	
Site conditions/information	A location with different trees (i.e. with horse chestnuts and conifers) is required. At this location is also a drinking water spring and a water monument, which records the annual measurement data of Graz's drinking water.
Duration	5 minutes
Description of the activity	Question: How much water does a tree need? Can you correctly estimate the amount of water and its transport mechanisms in a horse chestnut tree? Answer format: multiple choice – A quiz is given with estimation questions that ask about water absorption, water transport, and water requirements of a tree (using the example of the horse chestnut).
Content 3 – Trees and water	
Δ ctivity 3.2 – Investigation	
Activity 5.2 Investigation	
Site conditions/information	Every tree needs a sufficient amount of water. How much water a tree absorbs per day depends on the tree species, tree size, weather, and water availability in the soil (= observing abiotic factors)
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Site conditions/information Duration Description of the activity	Every tree needs a sufficient amount of water. How much water a tree absorbs per day depends on the tree species, tree size, weather, and water availability in the soil (= observing abiotic factors) 15 minutes Questions: Can you identify how much water a tree needs by looking at its leaves? Answer format: free text – Leaves (a sun leaf, a shade leaf, a needle leaf) are collected. The leaves are analysed and compared according to a given scheme (leaf size, underside, upper side, hairiness, wax layer).
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Description of the activity	Question: 3.3. The water absorption and evaporation of trees have a particular impact on the microclimate, especially in the city. Can you name some of the effects? 3.4. Find out what effects the results can have on your own natural environment.
	Answer format: free text – Discuss your thoughts in a group and write the findings down.

Content 4 – Trees and living space for animals

Activity	4.1 -	Estimation
ALLIVIL	y 	LStimution

Site conditions/information	A tree is a habitat for various other creatures. The Franck oak was chosen as the location; more precisely, it is a pedunculate oak with the Latin name <i>Quercus robur</i> and belongs to the beech family. The oak is named after the founder of the city park, Moritz Ritter von Franck, and is around 150 years old. As one of the longest-lived native tree species, oaks can live for up to 1,000 years. Oaks therefore form long-lasting habitats and contribute to biodiversity. You can choose any other old tree.
Duration	5 minutes
Description of the activity	Question: How many animal species find a living space in an oak tree? (observing biotic factors) Answer format: multiple choice – In the form of a quiz, the different numbers of animal species that can live in an oak tree are to be estimated.

Content 4 – Trees and living space for animals

Activity 4.2 – Investigation

Description of the activity	Questions: Can you recognise animals or traces of animals in the root area of the tree? Can you recognise animals or traces of animals on the trunk of the tree? Can you see animals or traces of animals in the crown of the tree?
	Answer format: free text – Examine the roots, trunk, and crown and write down your observations.

Content 4 – Trees and living space for animals

Activity 4.3 – Reflection	
	A tree is a habitat for various other living organisms.
Site conditions/information	As a habitat, the tree is divided into levels (root, trunk, and
	crown). There are therefore things to discover in every old tree.
	Make observations to see if you can discover animals and
	animal tracks from the root, through the trunk to the crown. In
	our observation, it is an old oak, but you can choose any other
	old tree.
Duration	10 minutes
Description of the activity	Question: 4.3. What effect do old trees have on biodiversity? 4.4. Which tree is your favourite? Can you explain why you like it?
	Answer format: free text – Write down your thoughts.

Name of the trail:	Urban ecosystems and their meaning for biodiversity
	Hybrid model
How to find it on Discovery Trail:	<u>https://kool.avastusrada.ee/k/naturerlebnispark/dt-kartierung-sta</u> ndorte-stadtpark/enter
Screenshot:	<image/>
Developer:	Silvia Grabner, David Grabner, Sophia Trumpheller, Mojca Legvart
Addressed age group:	Grades 6–8
Addressed dimensions of biodiversity:	Understanding of three basic concepts (species diversity, genetic diversity, ecosystem diversity). General meaning of biodiversity in urban areas, with a special focus on ecosystems, more specifically habitats as a complex system

Relevant topics:	 3 basic concepts of biodiversity, introduction to scientific working methods, and increasing knowledge
General overview and aim:	 The general objective is to develop a general understanding of biological diversity in its 3 basic concepts (species diversity, genetic diversity, ecosystem diversity). Promote the understanding of complex ecosystems. Analyse a local problem related to biodiversity and become familiar with scientific working methods (selective mapping, recognition of regularities and frequencies) Analyse (compare, determine relationships) and interpret data and results of investigations and evaluations. Raise awareness of the importance of biodiversity in one's own environment, especially in urban areas, and recognising a possible need for action.
Framework conditions:	Time: about 3 hours Equipment required: Mobile phones or tablets with internet access for all participants No essential prior knowledge is expected. The participants will be divided into four groups. One supervisor will guide each of the 4 groups for all tasks during the DT. Motivating framework (narrative, context): A framework story is used as motivation, in which the urban park environment is to be

Flowchart	
1 Introduction to Biodiversity and DT • Activity 1.1: Different levels of biodiversity • Activity 1.2: Meaning of biodiversity • Activity 1.3: Loss of biodiversity • Activity 1.3: Get access to Discovery Trail on Avastusrada platform	 2 Exploring cosystems Activity 2.1: Exploring and monitoring Activity 2.2 Comparing the text and own investigations Activity 2.3: Discussions for common conclusions
Modules of the trail	
Content 1 – Introduction to b	iodiversity and the DT
Activity 1.1 – Introduction to	biodiversity
Site conditions/information	Laminated pictures on genetic diversity, species diversity, and ecosystem diversity; laminated cards with terms from the respective fields.
Duration	10 minutes
Description of the activity	Question: What do you associate with the term biodiversity? A picture (ecosystem diversity, species diversity, genetic diversity) is used for this introduction to the topic of biodiversity. The participants (school classes and hobby groups) collect a card with a term from these three areas and try to attribute this term to a subject area. It is important that they can argue why they assign this term to the respective area (individual evaluation and argumentation).
	Answer format: free text
Content 1 – Introduction to biodiversity and the DT	
Activity 1.2 – Meaning of his	diversity

Site conditions/information	Laminated picture showing the sociological, ecological, and economic importance of biodiversity. Laminated cards with terms from these areas.
Duration	10 minutes
Description of the activity	Question: What does biodiversity mean to you?
	A picture (sociological, ecological, and economic significance of biodiversity) is used for this introduction to the topic of the importance of biodiversity. The participants (school classes and hobby groups) pick a card with a term from one of these three areas and try to categorise this term into one of the areas. It is important that they can argue why they assign this term to the respective category (individual evaluation and argumentation).
Content 1 – Introduction to b	iodiversity and the DT
Activity 1.3 – Loss of biodive	rsity
Site conditions/information	4 laminated pictures about pollution, climate change, invasive species, and land use change.
Duration	10 minutes
Description of the activity	Question: What leads to biodiversity loss?
	Participants (school classes and hobby groups) discuss which aspects lead to the main loss of biodiversity and try to prioritise them together. (joint discussion and interpretation).
	Answer format: free text
Additional comments	All activities take about 40 minutes in total. The participants (school classes and hobby groups) are divided into 4 groups. They will work on the three introductory topics in a 10-minute rotation or are introduced to the use of the Avastusrada platform for approx. 10 minutes and are given access to the current Discovery Trail.
Content 2 – Exploring ecosys	tems

Activity 2.1 – Exploring and monitoring	
Site conditions/information	The City Park of Graz is well suited to the study of different ecosystems. To investigate the conditions of an ecosystem, the animals and plants living in it and the abiotic factors must be analysed. During a walk through the city park of Graz, ecosystem conditions will be investigated for four selected animals: the hummingbird hawk-moth (<i>Macroglossum stellatarum</i>), the hedgehog (Erinaceidae sp.), the purseweb spider (<i>Atypus affinis</i>), and the European green woodpecker (<i>Picus viridis</i>). It will be discussed if the city park has optimal ecosystem conditions for these animals or not.
Duration	20 minutes
Description of the activity	Question: Which abiotic factors can you find? Answer format: free text
Description of the activity	Questions: How many different plants can you find? How many different animals can you find? (Exploring biotic factors) The participants (school classes and hobby groups) analyse the conditions at selected points in the city park. First, some abiotic factors are noted (day, time of day, temperature, humidity, light intensity). All the animals and plants that can be found in an area of approx. 1 m ² are counted and registered on a mapping sheet and then, all the key results are added into the Discovery Trail. Answer format: free text
Content 2 – Exploring ecosys	tems
Activity 2.2 – Comparing the	text and own investigations
Site conditions/information	Written information about the respective animal is presented (text)
Duration	10 minutes

Description of the activity	Question: Do you think this area is a suitable environment for the hummingbird hawk-moth (<i>Macroglossum stellatarum</i>), the hedgehog (Erinaceidae sp.), the purseweb spider (<i>Atypus affinis</i>), and the European green woodpecker (<i>Picus viridis</i>)? Why? The participants are given a description of the different animals, each of which contains information about the animal's way of life and living conditions. They now must decide on the basis of their research results and the fact sheet (text) if the location they have investigated in the city park is a suitable living space for the respective animal. They must use arguments to explain their decisions.
	Answer format: free text
Content 2 – Exploring ecosys	tems
Activity 2.3 – Discussion of c	ommon conclusions
Site conditions/information	Place for group discussions
Duration	10 minutes
Description of the activity	Question: Individual analyses and decisions are discussed in groups. The discussions are to show different points of view and arguments.
	Answer format: free text
Additional comments	To give the individual participants enough time to analyse the selected areas and animals, only two areas or animals were addressed per group (approx. 80 minutes) and brought together in the general final discussion that followed.
Content 3 – Reflections and a	discussions
Activity 3.1 – Overall reflecti	on on the investigations and results
Site conditions/information	A general meeting will take place again at the starting point (end point) of the Discovery Trail.
Duration	10 minutes

Description of the activity	Question: Will the selected animals find a suitable environment in the City Park of Graz or do improvements need to be considered when planning the future design of the city park? The participants discuss and write down what they find out. Answer format: free text
Content 3 – Reflections and discussions	
Activity 3.2 – Discussions about additional and deeper questions	
Site conditions/information	Place for discussions
Duration	40 minutes

Description of the activity	Questions:
	What can I do to improve the hedgehog's environment in my own neighbourhood? (What small structures are there? Which ones are especially suitable for hedgehogs?) The question is aimed at individual options for action.
	Purseweb spiders spend their entire lives in tubes in the ground. They therefore need healthy soil to survive. A healthy soil depends on the biodiversity of life in the soil and appropriate care measures. Can you name 1–2 factors that contribute to healthy soil? Give reasons for your decision. The question is aimed towards an understanding of biodiversity and general recommendations for management measures.
	The hummingbird hawk-moth visits flowers. Why do flowers need to be pollinated? What would be the consequences for us humans if flowers were not pollinated by insects? The question is aimed at developing visions for the future.
	The habitat of the green woodpecker consists of a combination of short-cut meadows, old trees, and 'dead wood'. In addition to ecological functions such as those for the green woodpecker, the green space in the city park also fulfils important functions for humans. However, where different (utilisation) interests meet, various conflicts can also arise. What is your favourite activity in the city park? Name 1–2 activities and explain whether they can have a positive or negative effect on the natural living space for plants or animals. The question is aimed at the effects of one's own actions.
	Answer format: free text