EcoSTEAM CONTENT

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1 TOPIC. ENVIRONMENTAL AWARENESS AND CONSERVATION

1.1. SUBTOPIC. ECOSYSTEM BIODIVERSITY

1.1.1. ACTIVITY PLAN: INVESTIGATING LOCAL BIODIVERSITY

Introduction part (or activity overview)	This activity aims to engage students in exploring and understanding local biodiversity. Through fieldwork, students will document various species, analyse the ecosystem's health, and present their findings creatively
Setting	Location: Local Park or natural area for fieldwork, classroom for analysis and presentation. Educational Context: Collaborative group work (4-5 students per group).
Materials needed	Field notebooks and pens Cameras or smartphones for taking pictures Identification guides or apps for local flora and fauna GPS devices or mapping apps Computers with Internet access for research Presentation software (e.g., PowerPoint)
Learning Outcomes	• Develop skills in fieldwork and species identification. • Understand the importance of biodiversity and ecosystem health. • Enhance abilities in data collection, analysis, and presentation.
Activity Contents	**Theoretical Part (Duration: 60 minutes)**: Begin with an introduction to the importance of biodiversity and the role of ecosystems. • **Introduction to Biodiversity**: o Explain what biodiversity is and why it is crucial for ecosystem health and stability. Discuss the different levels of biodiversity: genetic, species, and ecosystem diversity. o Highlight the major threats to biodiversity, including habitat loss, pollution, climate change, and invasive species. • **Methods for Investigating Biodiversity**: o Teach students various techniques for conducting fieldwork, such as transects, quadrats, and direct observation. o Provide an overview of using identification guides and apps to recognize local flora and fauna. o Discuss methods for recording data accurately in field notebooks and using digital tools. • **Case Studies**: o **Case Study 1: Urban Biodiversity**: Present a case study on biodiversity research conducted in an urban park. Discuss the findings and their implications for urban planning and conservation. o **Case Study 2: Forest Ecosystems**: Share a case study on biodiversity in a forest ecosystem. Highlight the importance of different species and their interactions. **Discussion Prompts**: • Why is biodiversity important for ecosystem health?

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	• What are the key challenges in studying local biodiversity? • How can individuals contribute to biodiversity conservation? **Activity 1** **Task 1: Fieldwork and Data Collection (Duration: 90 minutes) Objective**: To conduct fieldwork and collect data on local biodiversity. • **Step 1**: Form groups and assign each group a specific area within the local park or natural area to study. • **Step 2**: Use field notebooks, cameras, and identification guides to document the species found in the assigned area. Record observations about the ecosystem's health, such as the presence of pollutants or signs of habitat destruction. • **Step 3**: Collect data on species diversity, abundance, and any notable interactions between species. **Task 2: Data Analysis and Interpretation (Duration: 60 minutes)** **Objective**: To analyze the collected data and interpret the findings. • **Step 1**: Compile the data collected during fieldwork and use spreadsheets or data analysis software to organize and analyze it. • **Step 2**: Interpret the data to draw conclusions about the health of the local ecosystem and the diversity of species present. Consider factors such as species richness, evenness, and any observed threats to biodiversity. • **Step 3**: Develop recommendations for improving or conserving the local biodiversity based on the analysis. **Task 3: Presentation and Feedback (Duration: 45 minutes) Objective**: To present the findings and recommendations to the class and receive feedback. • **Step 1**: Each group creates a presentation summarizing their fieldwork, data analysis, and recommendations. Use digital tools to create engaging and informative presentations. • **Step 2**: Present the findings to the class and conduct a Q&A session where other students and the instructor can provide feedback and ask questions. • **Step 3**: Reflect on the feedback received and discuss potential improvements.
Assessments	Accuracy and thoroughness in data collection and fieldwork. Depth of analysis and interpretation of biodiversity data. Quality and feasibility of recommendations based on the analysis. Clarity and creativity of the presentation. Team collaboration and dynamics.
Key Competences	Research and fieldwork skills Data collection and analysis Critical thinking and problem-solving Effective communication and presentation skills Teamwork and collaboration

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Connections with Eco STEAM	Eco - Understanding and addressing local biodiversity and ecosystem health. Science - Applying scientific methods for fieldwork and species identification. Technology - Utilizing digital tools for data collection and analysis. Engineering - Developing recommendations based on the analysis of ecosystem health. Arts - Creating engaging presentations and visual representations of data. Math - Using statistical methods and data analysis to support research findings.
References	-
Notes	This activity can be extended into a longer-term project, where students continuously monitor local biodiversity and engage in conservation efforts.

Evaluation Criteria Table for Investigating Local Biodiversity Activity

Evaluation Criteria	Points Available	Comments
1. Accuracy and Thoroughness in Data Collection and Fieldwork	20	Assess the precision and comprehensiveness of the data collected during fieldwork.
2. Depth of Analysis and Interpretation of Biodiversity Data	20	Evaluate the depth and rigor of the analysis and interpretation of biodiversity data.
3. Quality and Feasibility of Recommendations	20	Rate the reliability and practicality of the recommendations based on the analysis.
4. Clarity and Creativity of the Presentation	20	Rate the clarity, creativity, and professionalism of the presentation.
5. Team Collaboration and Dynamics	20	Assess the level of teamwork, including communication, cooperation, and mutual support among team members.

Total Points: 100

1.1.2. ACTIVITY PLAN: INVESTIGATING OSMOSIS IN CHICKEN EGGS

Introduction part (or activity overview)	Students watch a video – the naked egg and osmosis (Duration: 5:47 minutes) https://www.youtube.com/watch?v=SrON0nEEWmo Use gloves and overalls when handling the food colouring, since it can easily stain. Corn syrup can be very messy so make sure you have some tissues close by. Some people are allergic to eggs. If you are one of them, do not worry, use a potato instead (or other vegetables/fruit). http://acaai.org/allergies/types/food-allergies/types-food-allergy/egg- allergy.

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Setting	A lab/ chemistry classroom or home kitchen
Materials Needed	Egg, Vinegar, Corn Syrup, Container, Spoon, Food Colouring, Apron, Gloves.
Learning Outcomes	• To demonstrate and compare the effects of osmosis. • To understand how changing osmotic potential effects the net movement of water.
Activity Contents	**Activity 1: Osmosis effect (Duration: 80 min.)** **Theoretical part:** *Introduction discussion*: (10 minutes) The teacher introduces the students to the steps of conducting the osmosis experiment. He divides the students into three groups. He gives one group the task of keeping the egg in vinegar for 24 hours, the second group for 48 hours, so that after the first 24 hours they will change the vinegar and the third group will bring an untreated egg. Step 1: Place the egg very gently into the base of the container. Make sure that the egg does not crack, if it does, replace the egg. Step 2: Pour vinegar on top of the egg, making sure that the egg is fully submerged. Step 3: Leave the egg in the vinegar for about 24 hours. Step 4: If egg shell does not dissolve in 24 hours, replace the vinegar in the container with a new vinegar solution and leave for another 24 hours. Step 5: When the shell has dissolved, remove the solution and carefully rinse the naked egg. Step 6: Compare how a normal egg looks with how the naked egg looks. Step 7: Place the naked egg back in the container. Step 8: Submerge the naked egg with corn syrup. Step 9: Bend a spoon and use it to hold down the egg in the container. Step 10: Leave the naked egg in the corn syrup for a further 24 – 48 hours. Step 11: Pour out the corn syrup and give the resultant shrivelled egg a rinse. Step 12: Compare the resultant egg with a normal egg. Step 13: Fill the container with water, add a few drops of food colouring and stir the solution. Step 14: Place the shrivelled egg in the container and leave it for a few days (24-48 hours should do). Step 15: Observe the new egg shape. **Activity 2: Discussion (Duration: 50 min.)** The teacher discusses and analyzes connected topics: Osmosis, water molecules, salt concentration, semi-permeable membrane, equilibrium. Students discuss what they witnessed, what they produced, how was it achieved. **Example questions (reflection):** **Why do we remove the eggshell?** To reveal the egg membrane. **Why does the egg expand in vinegar?** To reveal the egg membrane. **Why does the naked egg change shape in corn syrup?** Water moves out of the egg. **Why does the eggshell dissolve in the vinegar?** The acid in the vinegar reacts with the eggshell (calcium carbonate). **Why did the egg float when left for a couple of hours in the vinegar solution?** Carbon dioxide forms when the egg shell dissolves causing the egg to float.

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	Activity 3 – Research (Duration: 30 minutes) Students look at some applications and research connected with the topic: https://www.nasa.gov/mission_pages/station/research/experiments/846.html http://dc.engconfintl.org/membrane_technology_vii/27/ http://puretecwater.com/reverse-osmosis/what-is-reverse-osmosis **Additional tips** Try experimenting with different liquids present in the kitchen and observe their effects on the egg. Use different sodium chloride concentrations such as 0%, 10%, 20%, 30%…100%. Use a weighing balance to weigh the egg before placing in the saline solution and after. When there is no change in mass, then the solution is isotonic that is the concentration of solutes inside the egg is equal to the concentration of solutes outside the egg. Try varying the temperatures, to see if temperature has an effect on rate of osmosis. Be careful not to cook the egg though!
Assessments	The final result is evaluated with a grade. All students in the class can be included in the evaluation. Each student independently evaluates his contribution to the work. Students can compete in the best-performed experiment. The assessment takes into account: student engagement, egg shape, description, costing and conclusions.
Key Competences	Communication competence Cognitive competence Creativity competence
Connections with Eco STEAM	**Eco** - using natural materials, from the kitchen **S**ience - knowledge of chemistry, biology and physics; environmental sciences – fostering sustainability thinking. **T**echnology - using a computer in the research process. **E**ngineering - electricity production **A**rt - use of colors **C**hemistry - preparation of chemical solutions
References	https://www.youtube.com/watch?v=SrON0nEEWmo http://www.madsci.org/posts/archives/2002-02/1014825690.Cb.r.html https://www.khanacademy.org/science/biology/membranes-and-transport/diffusion-and-osmosis/v/osmosis https://www.exploratorium.edu/cooking/eggs/activity-naked.html http://dc.engconfintl.org/membrane_technology_vii/27/ http://puretecwater.com/reverse-osmosis/what-is-reverse-osmosis
Notes	

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Assessment Table for individual work:

Evaluation Criteria	Points	Comments
Understanding the process of osmosis	_/5	
Communication competence	_/5	
Cognitive competence	_/5	
Competence for creativity	_/5	
Answered questions correctly	_/10	
Completed homework	_/10	

Assessment Table for group work:

Assessment Criteria	**Points**	**Comments**
Internet research skills	_/5	
Difference in egg size, before and after osmosis	_/10	
Calculation of cost price	_/5	
Ecological Interpretations in the project	_/5	
Teamwork and Collaboration	_/5	
Skills of presenting the work	_/5	

1.1.3. ACTIVITY PLAN: MATH MODELS FOR BIODIVERSITY AND ECOSYSTEMS

Introduction part (or activity overview)	The purpose of this activity with its tasks is for students to get familiar with the mathematical models and formulas that provide an analysis of the diversity index and the relationships in an ecosystem. Based on the calculations of abundance, species richness and diversity, as well as the interpretation of diversity indices (several types), students should draw conclusions about particular ecosystem(s) or communities. Main idea is to understand the meaning of biodiversity on this planet, and to be more aware of endangered species.
Setting	Classroom
Materials Needed	Computer (phone or tablet can be used to watch the videos, to do some calculations), notebooks, pens, calculators, A3 format of paper, paints or markers, stickers, styrofoam, different objects, push pins in different colours.
Learning Outcomes	• Develop a greater awareness for disrupting diversity by disrupting ecology in an environment.

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- Learn about the different formulas for calculating diversity indices.
- Make calculations and interpret different scenarios for different ecosystems.
- Acquisition of computer skills for statistical data processing.

Activity Contents

Activity: Math models for biodiversity and ecosystems

Theoretical Part (Duration: 45 minutes): What is biodiversity? Can you explain how one ecosystem is more diverse than other? Share opinion about examples of more and less diverse ecosystems? Instructions for work in MS Excel to do the calculations easier and faster. Information about math models and formulas for these diversity indices

Simpson's Index

Species (i)	Lake A			Lake B		
	count (n_i)	n_i/N	$(n_i/N)^2$	count (n_i)	n_i/N	$(n_i/N)^2$
1	1	1/25 = 0.04	0.0016	5	5/25 = 0.2	0.04
2	1	1/25 = 0.04	0.0016	5	5/25 = 0.2	0.04
3	1	1/25 = 0.04	0.0016	5	5/25 = 0.2	0.04
4	1	1/25 = 0.04	0.0016	5	5/25 = 0.2	0.04
5	21	21/25 = 0.84	0.7056	5	5/25 = 0.2	0.04
S = 5	N = 25	$D = \sum_{i=1}^{S} \left(\frac{n_i}{N}\right)^2$	0.71	N = 25	$D = \sum_{i=1}^{S} \left(\frac{n_i}{N}\right)^2$	0.2

Shannon-Weiner Index

Species (i)	Lake A				Lake B			
	count (n_i)	p_i	$\ln(p_i)$	$p_i * \ln(p_i)$	count (n_i)	p_i	$\ln(p_i)$	$p_i * \ln(p_i)$
1	1	0.04	-3.219	-0.129	5	0.2	-1.609	-0.322
2	1	0.04	-3.219	-0.129	5	0.2	-1.609	-0.322
3	1	0.04	-3.219	-0.129	5	0.2	-1.609	-0.322
4	1	0.04	-3.219	-0.129	5	0.2	-1.609	-0.322
5	21	0.84	-0.174	-0.146	5	0.2	-1.609	-0.322
S = 5	N = 25	$H = -\sum_{i=1}^{S} p_i * \ln p_i$		0.661	N = 25	$H = -\sum_{i=1}^{S} p_i * \ln p_i$		1.61

Evenness Index

From above we know that H_{max} is 1.61 (i.e. the highest of the Shannon-Weiner Index values)

The Evenness Index for Lake A is $J = \frac{H}{H_{max}} = \frac{0.661}{1.61} = 0.41$

The Evenness Index for Lake B is $J = \frac{H}{H_{max}} = \frac{1.61}{1.61} = 1$

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	Short videos on this topic: https://www.youtube.com/watch?v=GK_vRtHJZu4 (Duration: 4:18) https://www.youtube.com/watch?v=ghhZClDRK_g (Duration: 3:37 - 4:22) Overview: Why is this topic important? **Task 1 (Duration: 30 minutes)** The students are given task of making two ecosystems in which they will use various objects as species or on 2 A3 sheet they will draw species of plants or animals, or even more creatively they will use stickers or styrofoam push pins as substitution for different species. Students can work individually or in pairs. (If they work in pairs one students will create Ecosystem A and the other Ecosystem B and after that compare the indices for each ecosystem and make short discussion about it) **Task 2 (Duration: 40 minutes)** In MS Excel students enter the data from the A3 paper or styrofoam models and they calculate the indices. After that make conclusions about the ecosystems and compare the calculated values with the theory. Presentation of each task activity. Short videos for this task: https://www.youtube.com/watch?v=7DOuku8876I (Duration: 2:08 – 4:07) Overview: Calculations for the Simpson's Reciprocal Indices. https://www.youtube.com/watch?v=esBAg3Hu4WE (Duration: 4:15 – 5:50) Overview: Calculations for the Simpson's Diversity Indices. https://www.youtube.com/watch?v=fjxWGZGzePk (Duration: 16:45 – 22:00) Overview: Calculations for Similarity Indices. https://www.youtube.com/watch?v=ghhZClDRK_g (Duration: 1:36 - 2:42) Overview: Calculations for Shannon Diversity Indices.
Assessments	The teacher evaluates the students' work and achievements through: ● Verbal feedback during class; ● Conversation with/among students; ● Monitoring of students during individual work; ● Observation the individual contribution of each student when working in groups; ● Evaluation of students' work and creation of an ecosystem with calculated diversity index; The final score is evaluated with a grade. It is possible to involve all students in the class in the assessment. Each student self-assesses his contribution to the work.
Key Competences	● Cognitive competence ● Digital competence ● Social, emotional and healthy living competences
Connections with Eco STEAM	**Eco -** Understanding that ecology directly affects all species, especially endemic ones. **S**cience - Knowledge of biology and ecology in biology for rate of biodiversity in an ecosystem. **T**echnology - Use of MS Excel to calculate the indices. **E**ngineering - Through ecosystem engineering and new applied concepts to improve the management in one community.

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	Art - Creation of two models of ecosystem with the same number of organisms (at least 10) on paper using drawings or illustrations (maybe some stickers), a styrofoam model on which are placed more of the same or different objects. **M**ath - Mathematical calculations and statistical tables for evaluating the diversity indices.
References	https://www.khanacademy.org/science/ap-biology/ecology-ap/community-ecology/v/simpsons-index-of-diversity https://www.youtube.com/watch?v=8dYSvo8EqFE https://www.youtube.com/watch?v=GEsGTzOedXw
Notes	• The activity should be adaptable to different local ecosystems and communities. • Encouraging students to be more aware about the diversity in their surrouning.

Assessment Table for Web Quest Reports:

Assessment Criteria	Points	Comments
Creativity for the model of ecosystem	_/5	
Reliability of numerical data	_/5	
Interpretation of the obtained results	_/5	

1.1.4. ACTIVITY PLAN: NATURE IN A BOTTLE	
Introduction part (or activity overview)	Two main processes are being studied here: photosynthesis and respiration. Students read and discuss any previous knowledge and experience. http://www.bbc.co.uk/schools/gcsebitesize/science/add_ocr_gateway/green_world/photosynthesisrev1.shtml Students watch a video on making a terrarium (Duration: 9:00 minutes) https://www.youtube.com/watch?v=7Lg4tzkHgVo&t=7s
Setting	A lab/ chemistry classroom
Materials Needed	Stoppered glass jar, Pebbles, Compost, Rocks, Seeds/plantlings, Water, Ants/woodlice/worms, Soil, Bowl
Learning Outcomes	• To understand the process of photosynthesis. • To understand the process of decomposition by detritivores.
Activity Contents	**Activity 1: Making a terrarium (Duration: 80 min.)** **Theoretical part:** *Introduction discussion*: (10 minutes) **The teacher introduces the students to the steps of making the terrarium** Step 1: Clean the glass jar and add a layer of rocks, pebbles and soil to the bottom of the jar (preferably in that order). Step 2: In a bowl, dampen the compost and place a layer over the soil. Step 3: Select a small number of seeds/seedlings and embed them into the soil. (If using

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	seeds, ensure that they are placed deep enough and if using plantlings make sure that the roots are fully embedded within the soil). Step 4: Pour a small amount of water over the compost. Step 5: Place a few insects on the soil. Step 6: Seal the container and place in a well lit area. **The students start making the terrarium, following the steps according to the teacher's instructions** **Activity 2: Discussion (Duration: 50 min.)** The teacher discusses and analyzes connected topics: Photosynthesis, chloroplast/chlorophyll, formation of oxygen as byproduct, respiration, decay process. Students discuss what they witnessed, what they produced, how was it achieved. **Example questions (reflection):** ***Why is the system sealed?*** To prevent gases from escaping. ***Why should the container be placed in direct sunlight?*** To allow the plants to photosynthesise. ***Why should the container be transparent?*** To allow light to pass through in order to reach the plants. ***Why do we add both soil and compost?*** To aerate the soil for the roots. ***Why do we add the insects?*** To break up decaying material and increase the nutrient content within the soil. **Additional tips** Try covering the container with foil or cardboard paper – the terrarium should not grow. Investigate the rate of plant growth by exposing the terrarium to different types of light sources (natural, UV, artificial, LEDs etc). Try growing the terrarium without the rock layer or without the insects and observe how this influences the microcosm.
Assessments	The final result is evaluated with a grade. All students in the class can be included in the evaluation. Each student independently evaluates his contribution to the work. Students can compete for the best-made terrarium through online voting and questionnaires. The assessment takes into account: the terrarium (its design, decoration, number of plants used), description, cost calculation and conclusions.
Key Competences	Communication competence Cognitive competence Creativity competence Social, emotional and healthy living competences
Connections with Eco STEAM	**Eco** - selection of ecological materials for making a terrarium. **S**ience - knowledge of chemistry, biology and mathematics; environmental sciences – fostering sustainability thinking. **T**echnology - using a computer in the research process.

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	Engineering - creation of oxygen. **A**rt - arrangement. **M**athematics - calculating the costs and price of terrarium production.
References	https://www.youtube.com/watch?v=7Lg4tzkHgVo&t=7s http://www.bbc.co.uk/schools/gcsebitesize/science/add_ocr_gateway/green_world/photosynthesisr ev1.shtml
Notes	Activity 1 may take a while until the seeds have sprouted and the terrarium is complete. 

Assessment Table for individual work:

Evaluation Criteria	Points	Comments
Understanding the process of photosynthesis	_/5	
Understand the process of decomposition by detritivores	_/5	
Communication competence	_/5	
Cognitive competence	_/5	
Competence for creativity	_/5	
Answered questions correctly	_/10	
Completed homework	_/10	

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Assessment Table for group work:

Assessment Criteria	Points	Comments
Internet research skills	_/5	
Terrarium design, decoration	_/10	
Calculation of cost price	_/5	
Ecological Interpretations in the project	_/5	
Teamwork and Collaboration	_/5	
Skills of presenting the work	_/5	

1.1.5. ACTIVITY PLAN: ECO-EXPLORERS: TESTING THE WATER QUALITY	
Introduction part (or activity overview)	Experimental research is aimed at connecting theoretical activity with experimental demonstration, discovering new methods and concepts by examining the purity of water, as well as confirming the fact that it is one of the most important substances and resources in nature and without it there is no life.
Setting	A chemistry cabinet to demonstrate the experiment, a local sampling area, a natural water source, water mains and bottled water
Materials Needed	**Laboratory equipment:** 300cm^3 Erlenmeyer flask, 20cm^3 mixing pipette, 50cm^3 burette, funnel, beaker and stand pH meter **Reagents:** solution AgNO3 C=0.05 mol/dm^3 , K2CrO4 5% solution Cameras or smartphones
Learning Outcomes	• Expanding and deepening knowledge about eco systems, gaining new experiences and expanding one's conceptual understanding through experimental activities • Enhancing a sense of teamwork through research activity with environmental content and cooperation between group members • Developing critical expression by presenting experimentally obtained results on water pollutants and illegal amount of chloride salts
Activity Contents	**Activity 1 (Duration: 45 minutes): Taking a water sample for analysis** **Theoretical part** (Duration: 10 minutes): Discussion about the method of taking a water sample that depends on the place of sampling. A sample of the water supply network is taken from the starting and ending points of the network, but previously it is allowed to flow from the tap for 5-10 minutes.

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Video: https://www.youtube.com/watch?v=jz63HqVerUM

Overview: The video covers physical, chemical and biological tests in chemical laboratories, showing how samples are stored and prepared for testing.

Physical examination procedures include temperature measurement, determination of color, transparency, density, odor and taste.

Chemical procedures serve to determine the pH value, the presence of salts in the water (nitrates, chlorides, carbonates, sulfates, etc.).

Microbiological tests are aimed at identifying the microorganisms present in the water.

Duration: Approx. 5 minutes

Task (Duration: 20 minutes): Students take sample from a natural water source in the local community and a sample from bottled water and prepare three samples for analysis.

Activity 2: Demonstrating the experiment and determination of chloride content in water samples
Theoretical part (20 minutes):

Consideration of possible ways to reduce water pollution, highlighting the importance and role of water as a natural resource, which is increasingly polluted and in short supply (10 minutes).

Discussion about the experimentally obtained results of water pollution, proving the hypothesis that
the drinking water in our place of residence is safe and has the presence of a permissible concentration of chlorides (10 minutes).

Video: https://www.youtube.com/watch?v=xEAIjx5BcSY (5 minutes)

Experimental Part (Duration: 60 minutes):
The students get a work obligation to demonstrate the experiment, by analyzing three water samples:
Pipette 20 cm^3 of the solution into an Erlenmeyer flask with a mixing pipette. Add 3 - 4 drops of indicator K2CrO4 (the sample turns yellow).
It is titrated with a standard AgNO3 solution with C= 0.05 mol/dm^3. Chlorides are deposited as a white precipitate (yellow coloration is due to the indicator).
Titration is continued until a pale brown color appears. The titration is repeated 3 times and the mean value is calculated.

An overview of the aims and methods of experimental research

- Students apply their knowledge, skills and abilities to be able to determine the presence of chlorides of chlorides in water samples experimentally with methods

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	for experimental analysis. ● Researches and performs laboratory analyzes with the specified chemicals and laboratory equipment ● Students apply their knowledge to gain new experiences and expand their conceptual understanding through experimental activities. **Task (Duration: 2 hours):** Students work in groups, conduct an experimental analysis of three water samples, at the end of the experimental research they present and compare the obtained results. They make a conclusion which of the sampled water is of higher purity and with what concentration of chloride salts. *Step 1: analysis a sample from a natural water source in the local community and a sample from bottled water and prepare three samples for analysis *Step 2: analysis a sample from a natural water source in the local community *Step 3: analysis a sample from a natural water source in the local community and a sample from bottled water
Notes	Forms Techniques for Research and Data Entry : Group learning, teamwork through the method of observation and experimental demonstration. ● Handle silver nitrate with care ● Direct students to develop critical thinking about all pollutants of ecosystems
Assessments	Monitoring of exploratory analyzes and synthesized group activities related to water purity. Evaluation of presentation the experimentally obtained results for the presence of chlorides in water according to Mohr's procedure, which has a significant role in eco systems. Each student self-assesses his contribution to the work.
Key Competences	● Cognitive competence ● Creativity competence ● Social, emotional and healthy living competence ● Cultural competence
Connections with Eco STEAM	**Eco** - develop environmental awareness through scientific and experimental methods **S**cience - ecological science (examination of the quality of eco system – water) **T**echnology - use of digital tools for research **E**ngineering - argentometric volumetric procedure that is used in chemical engineering **A**rts - drawing tables, graphs of experimental results **M**ath - mathematical calculations for volume during titration

Water temperature	12˚C	
Dullness	/	

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Transparency (clarity)		
Smell	Odorless	
Taste	No taste	
Colour	Colorless	
pH value of the water	7	
Location where the sample was taken	Chemical laboratory	

References	• Analitical chemistry-Argentometry - Volumetric method in Quantitative analysis • Article "Adaptation of the Mohr Volumetric Method to General Determinations of Chlorine" • Ionic Equilibria in Analytical Chemistry – Jean Louis Burgot

RESEARCH GUIDE FOR ACTIVITIES
RESULTS OBTAINED FROM THE WATER ANALYSIS AND COMPARISON WITH THE LIMIT VALUES FROM ACTIVITY 1
RESULTS OBTAINED FROM THE WATER ANALYSIS AND COMPARISON WITH THE LIMIT VALUES FROM ACTIVITY 2

Table for permissible values of chlorides in water

	Obtained values	**Allowed values**
Chlorides	17,725 mg/L	200 mg/L

Assessment Table :

Assessment Criteria	**Points**	**Comments**
Handling laboratory equipment and reagents	_/5	
Experimental Research	_/5	
Describing experimental results	_/5	
Accuracy of calculations	_/5	
Quality of Presentation	_/5	

1.1.6. ACTIVITY PLAN: TYPES OF BACTERIA	
Introduction part (or	Through questions, the teacher activates the students' prior knowledge on

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activity overview)	bacteria. Students also watch a short video about bacteria: https://www.youtube.com/watch?v=ORB866QSGv8
Setting	Use the good bacteria to make yogurt or compost.
Materials Needed	Poster (can also be electronic), video presentation equipment, flip charts, markers, electron microscope, projectors and smart board.
Learning Outcomes	Students to learn about: ● Bacteria and types of bacteria ● Diseases caused by some bacteria ● Good bacteria
Activity Contents	**Activity 1: Introduction to Bacteria: Types, structure, functions and diseases (Duration: 30 minutes)** *Introduction discussion*: (10 minutes) **Theoretical part:** **The teacher introduces the students to the types of bacteria** Students discuss about the composition and shape of the bacterium, as well as its function. Then they research and share the diseases that are caused by them and about the method of treatment, while they look at bacteria one by one on an electron microscope. Students actively participate, trying to discover the organelles of the bacteria. **Activity 2: Analysis of forms and diseases caused by bacteria (Duration: 30 minutes)** ● Students are divided into two groups. The teacher includes a picture of the shapes and structures of bacteria on the projector, and the students analyze the shapes of the bacteria, name them and say which bacteria cause which diseases and create a poster. **Activity 3: Solving tasks related to the experiment (Duration: 20 minutes)** Students divide into two groups. The teacher gives them a task to solve: 1. One bacterium divides into two. Distribution is done every hour. How many bacteria will develop in 10 hours (1 group), and how many in 24 hours (2 group)? 2. There is a test tube in which the bacteria are placed. A bacterium divides into two every second. In exactly one minute they will fill the entire test tube. How long will it take to fill the test tube if you first put 2 bacteria in the test tube? o Students solve the problem using a geometric progression sum formula. $S_n = a_1 \frac{q^n - 1}{q - 1},$ o The students compete to see which group will solve the problem first and explain the

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	solution. **Activity 4: Discussion (Duration: 15 minutes)** Students give a conclusion regarding the lesson. It should emphasize the essential elements of the lesson. The students should be motivated to do further research on the internet about today's lesson and next class to present things that were not covered in class for that particular lesson. ● One student from each group reads the notes from ACTIVITY 2 from flip charts previously placed in visible places in the classroom. ● One student from each group from ACTIVITY 3 solves the problems on the board
Assessments	The final result is evaluated with a grade. All students in the class can be included in the evaluation. Each student independently evaluates his contribution to the work. Students can compete for the best drawing and the fastest solution to the tasks. The assessment takes into account: the poster (its design, decoration, number of drawn bacteria), speed of solving tasks.
Key Competences	● Cognitive competence ● Creativity competence ● Social, emotional and healthy living competence ● Cultural competence
Connections with Eco STEAM	**Eco** – good bacteria and their application. **S**ience – knowledge of chemistry, biology and mathematics; environmental sciences – fostering sustainability thinking. **T**echnology – using a computer in the research process, digitrons for calculation. **E**ngineering – creation of compost, yogurt, nitrogen fertilizers and the like. **A**rt – poster drawing. **M**athematics – calculating the number of bacteria after their reproduction.
References	https://www.youtube.com/watch?v=ORB866QSGv8
Notes	

Assessment Table for individual work:

Evaluation Criteria	Points	Comments
Understanding bacteria and types of bacteria	_/5	
Understanding diseases caused by some bacteria	_/5	
Understanding good bacteria	_/5	
Communication competence	_/5	
Cognitive competence	_/5	
Competence for creativity	_/5	

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Solving tasks	_/10	
Answered questions correctly	_/10	
Completed homework	_/10	

Assessment Table for group work:

Assessment Criteria	Points	Comments
Internet research skills	_/5	
Poster making, design	_/10	
Calculation of cost price	_/5	
Ecological Interpretations in the project	_/5	
Teamwork and Collaboration	_/5	
Skills of presenting the work	_/5	

1.1.7. ACTIVITY PLAN: WATER BODY STUDIES

Introduction part (or activity overview)	Chemical water tests are essential to determine water quality and identify various chemical substances that may affect human health, the environment, or other biological systems. These tests will help students monitor the condition of water bodies, identify sources of pollution, and take measures for water protection if necessary.
Setting	• Computer class. Students will work in pairs. • Water body. Chemistry laboratory. Students will work in pairs.
Materials Needed	**Materials:** water testing strips (which can determine 7 water parameters) i.e., chlorine content in water, acidity - pH, total or permanent water hardness (content of Ca and Mg sulfates and chlorides) - GH, nitrites - NO_2^-, nitrates - NO_3^-, carbonate or temporary water hardness (content of Ca and Mg bicarbonate (HCO_3^-) – KH, CO_2 content, samples of the water being tested, distilled water for rinsing. **Tools:** computers, phones, student activity sheet, bathometer (water sampler), clean and airtight containers for samples of the water being tested, chemical beakers, thermometer, filter paper. Or a portable "Okotest Water Laboratory" laboratory designed for water testing.
Learning Outcomes	• Deepen knowledge about water pollution issues, learn about the causes of pollution, its consequences, and possible preventive measures to be applied. • Conduct physical and chemical analyses of a water body, which will motivate students and encourage an interest in natural sciences and environmental protection. • Foster critical thinking and the ability to identify, analyze, and solve problems related

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	to water pollution.
Activity Contents	**Activity 1: Introduction to water pollution, its causes, and its impact on humans and nature.** **Theoretical Part (Duration: 10 minutes):** A discussion on water pollution. The importance of water for humans, plants, and animals is debated. **Information for the Teacher** Water is the most widespread substance on Earth, covering 2/3 of the Earth's surface. It is present in all living organisms and is essential for sustaining life. The reserves of fresh water on Earth are limited. Meanwhile, with the increasing human population and industrial development, more and more water is being consumed and polluted. Chemical water pollutants include: ● Detergents (various cleaning agents), which enter natural water bodies with domestic wastewater; ● Mineral fertilizers, often unbalanced and used in large quantities in agriculture. Washed out of the soil by precipitation, they usually enter natural water bodies in the form of nitrates; ● Heavy metals, whose main sources are industry and motor vehicle transport; ● Increased hydrogen ion concentration (pH), i.e., the so-called water acidity, is also very dangerous for water plants and animals. **Task (Duration: 35 minutes):** Step 1: Students are divided into groups. Step 2: Using digital sources or reviewing a link about water pollution: https://www.youtube.com/watch?v=bGWr5jXJfbs Duration: Approx. 4.05 minutes Step 3: Discuss the following topics: 1. Causes of water pollution: ● What are the main sources of water pollution? ● How do cities and industries affect the quality of water bodies? 2. The impact of water pollution on ecosystems: ● How does water pollution affect river and lake ecosystems? ● What are the most critical aspects of water pollution for animals and plants? 3. Urban wastewater: ● Why do cities treat wastewater and why is this process important? ● What can cities do to reduce the threat of sewage to water bodies? 4. Industrial pollution: ● What are the sources of industrial pollution contributing to water pollution? ● What are the most effective measures that industry can take to reduce its impact on water quality? 5. The impact of water pollution on human health:

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- How does water pollution affect human health?
- What are the health hazards of water pollution and how can they be mitigated?

6. Climate change and pollution:
   - How can climate change affect water pollution?
   - What can be done to reduce water pollution and adapt to changing climate conditions?
7. Legal regulatory measures:
   - What legal regulatory measures are in place to control water pollution?
   - How effective is the pollution control system and how is it implemented?
8. Youth education and awareness:
   - How to promote youth education and awareness in addressing water pollution issues?
   - What is the role of the youth in the future fight against water pollution?

Step 4: Each group prepares a presentation on a chosen topic using Microsoft PowerPoint, Padlet, Canva, Movie Maker (film creation), or another presentation program.

Activity 2: Investigation of the Condition of a Water Body.

Theoretical Part (Duration: 10 minutes): An introductory discussion in which the teacher explains about the study of surface water bodies and how to correctly perform water tests.

Information for the Teacher

The ecological condition of surface water bodies is assessed based on the indicators of physico - chemical, hydromorphological, and biological quality elements. The ecological condition is divided into five classes - very good, good, moderate, poor, and very poor. Physical indicators of natural water include color, odor, clarity, turbidity, temperature, and specific electrical conductivity. The assessment indicators for chemical quality elements are nitrate nitrogen ($NO3^-$), ammonium nitrogen ($NH4^+$), total nitrogen (Nb), phosphate phosphorus ($PO4^{3-}$), total phosphorus (Pb), biochemical oxygen demand over 7 days (BDS7) and the amount of dissolved oxygen in water (O2). The most commonly found cations in natural water are Na^+ , Ca^{2+} , Mg^{2+}, K^+ , and anions: HCO3- , SO42- , Cl^- , CO^{2-} . Other less common cations and anions are Fe^{2+}, Fe^{3+}, Mn^{2+}, SO32- .

Water contains dissolved gases: CO2, O2, N2, H2S, CH4. Chemical compounds formed due to the vital activity of organisms are called biogenic substances. These include various forms of nitrogen (ammonia, nitrites, nitrates), compounds of phosphorus, silicon, iron.

The pH indicator is very important for assessing water quality. The speed of biological and biochemical processes occurring in water, the forms of migration of chemical elements, and the development of water fauna and flora, etc., depend on the water environment. The pH of natural waters depends on the ratio of carbonic acid and bicarbonate concentrations and usually ranges from pH = 4.5 to 8.3. Depending on the time of year and day, the pH in river water can vary from 6.5 to 8.5. In winter, the pH usually ranges from 6.8 to 8.5, and in summer, from 7.4 to 8.2. The pH of effluent and polluted surface waters can change due to the acids and/or alkalis present in it.

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	Task (Duration: 80 minutes): Students are divided into pairs into groups. Step 1: Use a bathometer or a self-made device to collect water samples from a river, lake, pond, or sea. Step 2: Fill the bottles with water to the top to eliminate air. Measurements must be taken immediately or the samples kept cold (for example, in a refrigerator). Step 3: Assess the physical parameters of the water: color, odor, clarity/turbidity, and measure the water temperature with a thermometer. Step 4: Perform measurements with water testing strips (the strips determine 7 water parameters: Cl2 content in water; acidity - pH; total water hardness - GH; nitrites - NO2; nitrates - NO3; carbonate hardness of water - KH; CO2 content. Step 5: Dip the strip into the water sample bottle for 2-3 seconds, slightly move the strip for a more accurate result. Step 6: Remove the strip from the water, shake off the water. After a minute, you can compare the obtained results (colors that have appeared on the strip) with the data provided on the scale. CO2 results can be found in the table. Step 7: Record the obtained results in Table 1 (Appendix 1).
Assessments	Each student assesses their work according to the provided Appendix 2. Each group presents the results of their work, evaluates successes and failures, their contribution to the group work, and performs an oral reflection. The final result is graded. All students in the class are included in the evaluation.
Key Competences	• Cognitive competence • Creativity competence • Communication competence • Social, emotional and healthy living competences • Citizenship competence • Digital competence • Cultural competence
Connections with Eco STEAM	Eco - gain knowledge about the sources of water pollution, their impact on the environment, nature, and human health. Science - knowledge in biology, chemistry, economics, and environmental sciences. Technology - use of digital tools. Engineering – perform water quality analysis research. Art - visually observe natural changes in the presence of pollution sources. Math - application of mathematical calculations, which provide the ability to systematically analyze and interpret the data obtained from water testing.
References	*Link: Prevention of Groundwater and Surface Water Pollution in the EU (Updated: 09-10-2023)* https://byt.lt/OiGiu Surface Water Standards: https://byt.lt/gEjI2 *School Chemistry Experiments Practice. Student's Book. 2014, 219-222 pages.*

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APPENDIX 1. PHYSICAL AND CHEMICAL INDICATORS OF THE WATER BODY (FILLED OUT BY EACH GROUP SEPARATELY)

Report Sheet

Physical and Chemical Indicators of the Water Body

Date ……..

Surname, Name…….....…….....

Assumption / Hypothesis:

….....

Objectives:

.....

.....

Experiment results and their analysis.

Indicator and its units	Sample No.		
	1	2	3
Physical indicators:			
1. temperature, °C,			
2. color,			
3. odor,			
4. clarity/turbidity			
Nitrites NO_2, mg/L			
Nitrates NO_3, mg/L			

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Carbonate or temporary water hardness KH			
Total or permanent water hardness GH			
pH (Water acidity/alkalinity)			
Chlorine content in water (Cl_2)			
CO_2 content			

Concliusions:

.....

….....

...

…….....

.....

.....

Skills in performing theoretical and practical questions	I know very well, excellently	I know well	I know satisfactorily	What I didn't understand/couldn't do and what I would need to learn more about
1. Formulate the hypothesis, objectives, and tasks of the research work				
2. Create a research work plan				
3. Independently conduct the research work				
4. Evaluate the obtained results				
5. Formulate conclusions and present the work				

1.2. SUBTOPIC. WASTE MANAGEMENT AND RECYCLING

1.2.1. ACTIVITY PLAN: FOOD WASTE CULTURE	
Introduction part (or activity overview)	Students will learn the reasons for food wastage and ways to reduce food waste. By creatively using food leftovers to prepare dishes, students will contribute to reducing food wastage and a more environmentally friendly food supply chain.
Setting	Technology (nutrition) classroom.
Materials Needed	Smart devices (computer, phone), video projector, note sheet, pen, recipes, kitchen

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	equipment and tools, food products.
Learning Outcomes	• Be able to explain the impact of food waste on the environment, develop critical thinking skills, and environmental awareness. • Understand that the consumption of food products and the amount of waste generated depend solely on human consumption habits. • Learn how we can creatively and efficiently use food leftovers in cooking, thus contributing to less food waste and a more environmentally friendly food supply chain. • Using various cooking technologies, they will prepare dishes from food leftovers, serve them, taste, and evaluate.
Activity Contents	**Activity 1. Food Waste Culture – Reduce Your Footprint.** **Theoretical Part (Duration 15 min):** Introductory conversation. Discuss what food waste is, how the environment suffers due to food wastage, and talk about what unavoidable food waste is and what we can do at home to reduce the amount of food waste going to landfills. **Information for the teacher:** Food wastage is a social, ecological, and economic problem. According to the United Nations, about a third of the food produced worldwide is wasted, which globally amounts to about 1.3 billion tons of food per year. According to data from the EU, over 50 million tons of fruits and vegetables are destroyed annually in Europe. According to EU statistics, 80% of the wasted food is avoidable food waste, i.e., the food that was fit for consumption before being discarded. Discarded food (waste) means not only that this food could have been used to feed more people, and save money, but also that it is possible to reduce the negative impact on the environment related to food processing, storage, and production - climate change (plants and animals disappear, the weather becomes more extreme, sea levels rise, people migrate), enormous plots of land, labour, a lot of water, and energy are used in vain to grow and produce food for waste. In developed countries (where incomes are average or very high), most food is wasted at the consumption stage. This means that food is discarded, although it is still fit for consumption and could have been eaten. In low-income countries, less food is wasted at the consumption stage, with the greatest losses occurring in the initial stages of food production, processing, and handling. In Western Europe and North America, food waste amounts to 95–115 kg per person per year, while in Africa or Southeast Asia, it's only 6–11 kg per person. In Lithuania, almost a third of all food ends up in landfills. Each resident of Lithuania accounts for more than 50 kg of food waste per year. Sorting food waste is important from an environmental, economic, and social point of view: • By responsibly sorting waste, it won't end up in landfills. • By separately collecting and processing food waste, it can be turned into natural fertilizer, used to produce biogas, or compost. • Sorting food waste promotes an important social change - reducing the generation of such waste and food wastage. Food preparation and storage habits can also contribute to reducing the impact on the

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environment. Changing habits can reduce the amount of food wasted and contribute to environmental conservation.

Terms:

Food waste – food produced for human consumption but not eaten and discarded. This concept includes food products that spoil before they are discarded and those that are still edible at the time of disposal.

Food wastage (food waste) – the discarding of food suitable for human consumption, both before and after its expiration date.

Unavoidable food waste – the discarding of food that is not edible under normal circumstances (bones, potato peels, eggshells, peels of fruits and vegetables, etc.).

Avoidable food waste – the wastage of food that was edible before being discarded.

Food leftovers – refer to edible parts or components of dishes that are not consumed immediately and are usually thrown away.

Composting = a regulated process in which organic material naturally decomposes and turns into a nutrient-rich product called compost.

Task (Duration: 45 min): It is explained how learning will occur through the jigsaw method. It is announced that at the end of the lesson, the teacher will ask about the most important aspects. It is emphasized that not the "experts" but other "home" group members will answer, so it is crucial to ensure that everyone has understood and remembered the key points. It also explains how to evaluate the work of group members. Students will have to decide whether the information presented by others was clear and understandable.

Step 1. Small groups (of 3-4 students) are formed. These are called "home" groups.

Step 2. Each member of the "home" group receives a different task, which they must learn themselves and teach to other group members. (Appendix 1) Students analyze the given material individually and select the most important aspects, noting them down.

Step 3. Students re-group: they are divided into "expert" groups. Each grou consists of students who have the same part of the learning material. They discuss the material together and plan how to teach their "home" group friends in a way that others would understand the information.

Step 4. Students return to their "home" groups and teach each other. The goal of the group is for everyone to learn all the material well.

Task (Duration: 35 minutes): To consolidate the material, students take a habits test, "Climate Change in the Kitchen." (20 min).
https://www.vartotojai.lt/sincerelyfood/test/kitchen/

After completing the test, students are encouraged to reflect on what each of them individually could and would like to do to change the situation and what they could do in the near future.

Activity 2 (Duration: 90 minutes): Transformation of Food Leftovers.

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	Step 1. Preparation for the lesson: attire, hygiene requirements, necessary products, working tools, remembering the requirements for work safety. Step 2. Working in groups, discussing the technological sequence of the dish, and dividing the work. Step 3. While sorting waste, following technological and hygiene requirements, students prepare dishes according to their created recipes. They record the work stages and the result. Step 4. They serve the dishes, taste, and treat members of other groups, evaluate the quality of the prepared dishes according to the presented dish quality evaluation criteria (Appendix 3). Step 5. They calculate the cost and nutritional value of the dish. Reflection. Students record and summarize the quality of dishes determined during the tasting, observations made by friends, challenges encountered, advantages and disadvantages of the work process, identify successes and failures, and their reasons.
Assessments	In Activity 1, the students themselves evaluate group work and self-assessment (Appendix 2). In Activity 2, the evaluation is according to the provided criteria.
Key Competences	Creativity competence Digital competence Cognitive competence Communication competence Citizenship competence Social, emotional and healthy living competencies Cultural competence
Connections with Eco STEAM	Eco – Gain ecological knowledge on methods to reduce the negative impact of food waste on the environment. Science – Knowledge in biology, chemistry, economics, and environmental sciences. Technology – Technology: reduce, reuse, recycle. Smart and creative use of digital technologies. Engineering - Students can create a model of reduce, reuse, and recycle, describing the movement of material among plants, animals, humans, and the environment. They can also cook dishes from food leftovers. Art – Creative solutions that encourage sustainable thinking and aesthetics. Math – Application of mathematical calculations in product production, calculation of the cost of a dish.
References	https://lt.wikipedia.org/wiki/Atliek%C5%B3_tvarkymas https://ec.europa.eu/food/safety/food_waste_en http://www.fao.org/food-loss-and-food-waste/en/ https://www.vmvt.lt/node/3717?language=lt Silver H. ir kt. Mokytojas strategas. Kaip kiekvienai pamokai pasirinkti tinkamą, tyrimais pagrįstą mokymo metodą, Vilniaus tarptautinė mokykla, UAB Rgrupė, 2012, 83-94 p.

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Notes	

Appendix 1. Tasks for students for the active learning method "Jigsaw".

Task for student 1:

- Write down (6-7) main reasons for food wastage.
- Explain what the terms "best before..." and "use by..." mean?

Task for student 2:

- Write down ideas (5-6) on how to reduce the amount of food wasted.
- Which groups of products (5) are wasted the most worldwide?

Task for student 3:

- Write down (2-3) statements to identify the problem of food wastage.

Food Wastage Problem	**Statements**
Social	
Economic	
Ecological	

Task for student 4:

- Write down 5 food supply chains.
- Identify (4-5) reasons for food wastage in the public catering sector and (4-5) reasons for food wastage in households.

Food Supply Chain	**Percentage of Wasted Food**	**Reasons for Food Wastage**
1.		
2.		
3.		
4.		
5.		

Appendix 2. Evaluation Table

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Group member	Explained well, and understood everything.	Not very clear, didn't understand everything.	Explained poorly, hardly understood anything.

Appendix 3. Dish Quality Evaluation.

Quality Criteria	Description of the Dish
Aroma.	
Appearance of the dish (Color. Texture. Shape)	
Taste.	
Technological execution. Cooking method (baked, undercooked, burnt, risen, collapsed, etc.) Cooking process - order of products, baking temperature, and duration. Use of the dish recipe or created by myself.	
Presentation of the dish. Portion size on the plate. Decoration of the dish. Originality (in a classical way).	
Caloric content, nutritional value.	
Value for money.	
Eco-friendliness.	

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1.2.2. ACTIVITY PLAN: “MAGIC OF LEFTOVERS”	
Introduction part (or activity overview)	The issue of food consumption and waste is closely linked to the health and fate of our Planet. The good news is that consumption can be sustainable. There are many simple ways to avoid food waste at home and in nature. Students will gain skills in sustainably storing recipes, creating, and managing electronic recipe books. The created recipe book will inspire other consumers to reduce food wastage, avoid food waste, and discover the joy of cooking with leftovers. Electronic books are digital books that can be viewed on a screen. They can be purchased, downloaded, and read over and over again like physical books.
Setting	The lessons will take place in the information technology classroom.
Materials Needed	Computers, mobile phones, video projector. Programs for layout include Google Docs, Canva, Book Creator, or other electronic tools. https:// www.storyjumper.com/ or https://bookcreator.com/
Learning Outcomes	• Deepen understanding of sustainable living solutions. • Improve digital skills in designing an electronic publication. • Gain knowledge about cooking with food leftovers and be able to explain its conserving impact on the environment articulately. • Understand the advantages of electronic recipe books and acquire basic knowledge about their storage and sharing. • Create an electronic recipe book.
Activity Contents	**Lesson situation. A continuation of the project work "The Journey of Food Leftovers".** Students, having conducted research in their families to identify the most frequently discarded food products and determined the causes of leftovers, learned in theoretical lessons that food waste occurs at all stages of the value chain – during production and distribution, in stores, restaurants, food and beverage supply locations, as well as at home. To address this issue, students sought innovative ways to reduce food wastage and efficiently use food leftovers, creating recipes. In practical activity lessons, students transformed food leftovers into new and nutritious dishes, such as soups, stews, or as ingredients for baked goods. This approach not only reduced food wastage but also encouraged creativity in the kitchen. **Activity 1. (Duration: 15 min). Creation of the electronic recipe book "Magic of Leftovers".** Introduction discussion. Saving recipes is not only a great way to preserve favorite dishes but also to share your culinary creations with others. The discussion explores how to save created recipes and how family traditional recipes are preserved. Can sharing your recipes with family and friends bring joy and connection? The discussion covers the significance of recipes, the importance of preservation, usefulness, and trends. The importance of electronic books is discussed.

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	Theoretical Part (Duration: 20 min). Tools for Creating Electronic Books. Information for the teacher: Google Docs or Google Sheets: Create a new document or spreadsheet and record all your recipes. You can access them from any device with an internet connection. Canva: A design platform that allows you to create visually appealing recipe cards. Save projects and access them in your Canva account. Book Creator or Blurb: Using these platforms, you can print the booklet or save it in electronic format. **Task. (Duration: 90 min).** Choose a platform or electronic tool to layout an electronic recipe booklet based on 4-5 selected recipes from dishes made from food leftovers. Step 1: Working group members select 4 – 5 recipes for dishes made in technology lessons. Step 2: Choose a platform, e.g., Canva, and select a template. Step 3: Insert the content. Step 4: Compile the recipes for the dishes, the work steps, and photos of the final result. Note the nutritional value of the dish. Step 5: Create a section on sustainable food consumption, writing recommendations for consumers on how to avoid food leftovers. Presentation and Evaluation of Work: Each student briefly presents one chosen recipe and explains why it was included in the booklet.
Assessments	Individual student work is evaluated. Evaluation table (Annex 1).
Key Competences	Creativity competence Digital competence Communication competence Citizenship competence Cultural competence
Connections with Eco STEAM	Eco – No ink or paper is wasted, resulting in two beneficial factors: a lower selling price than printed books and helping to conserve the environment. **Science** – The creation process involves interdisciplinary communication and collaboration (biology, chemistry, literature, IT). **Technology** – Searching for new recycling methods, waste reduction, or the use of energy-saving technologies. **Engineering** – Having created the electronic booklet, they will evaluate productivity and be able to look for ways to optimize the manufacturing process and reduce costs. **Art** – Develops visualization art skills by designing the booklet, encouraging creativity. **Math** – Engineering, technological, mathematical calculations.
References	https:// www.storyjumper.com/ https://bookcreator.com/

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	https://www.iklase.lt/e-knygu-kurimas-su-book-creator/ https://www.usebouncer.com/lt/patarimai-kaip-kurti-elektronine-knyga/ https://www.oetker.lt/receptai https://www.youtube.com/watch?v=lGnEv3FV57Q
Notes	

ANNEX 1. EVALUATION TABLE

Evaluation Criteria	Points	Comments
Innovation and creativity.	_/5	
Design.	_/5	
Technical implementation.	_/5	
Presented dish recipes, nutritional value.	_/5	
Sustainable consumption section.	_/5	
Presentation.		

1.2.3. ACTIVITY PLAN: CYCLE OF BIOMASS

Introduction part (or activity overview)	Deepen students' understanding of biomass as a renewable energy source and how environmental waste can be used to generate thermal energy. Initiate students to think and discuss about the biomass cycle and how the use of biomass as a renewable energy source contributes to a cleaner environment. This topic is not just about scientific principles; it's about paving the way for a sustainable and cleaner future.
Setting	Classroom
Materials Needed	Computer (phone or tablet can be used to collect information), Biomass cycle poster (it can also be digital), video presentation equipment, flip charts, markers
Learning Outcomes	• Understanding the concept of biomass and its various forms, including organic materials from plants and animals. • Identifying different sources of biomass and their characteristics. • Understanding the biomass cycle, detailing the stages from production to decomposition. • Recognizing the environmental impact of traditional energy sources and the need for sustainable alternatives.

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Activity Contents	**ACTIVITY 1 (65minutes) : How the biomass cycle works?** *Introduction discussion*: (10 minutes) Students, through brainstorming, list all the forms of biomass they know (animal and plant waste, wood waste, urban waste, etc.), the teacher writes them down on a flip chart. ***Theoretical part 1 (****15 minutes)* The teacher explains to the students that biomass has been in use since people first began burning wood to cook food and keep warm. Wood is still the largest biomass energy resource today. Other sources include food crops, grassy and woody plants, residues from agriculture or forestry, oil-rich algae, and the organic component of municipal and industrial wastes. Even the fumes from landfills (which contain methane, the main component in natural gas) can be used as a biomass energy source. Students then watch a short video about biomass: Video: **"Biomass energy basics"** https://www.nrel.gov/research/re-biomass.html (duration 3minutes 22 seconds) Overview: An educational video designed to provide foundational knowledge and understanding of the fundamental concepts related to biomass energy. *Theoretical part 2 (5 minutes)* The teacher explains to the students that biomass, depending on its type and composition, has a certain accumulated energy because of photosynthesis. This energy is usually converted into thermal and chemical, and further into mechanical and electrical. *Task 1 (20 minutes)* Students form 4 groups and discuss the cycle of biomass energy shown on the poster (it can be printed or in digital form https://www.shutterstock.com/image-vector/biomass-energy-landscape-poster-useful-infographics-2149391247), also what its benefits are for ecology. Researching using digital sources, students should be able to describe the cycle of biomass and complete the group activity sheet (Appendix 1). *Theoretical part 3 (5 minutes)* After the students in groups exchange their thoughts about the cycle of biomass, the teacher plays videos about this process: Videos: "**Bioenergy, forests and carbon sinks - Bioenergy explained**" https://www.youtube.com/watch?v=gUfJfHph-zk (duration 1minutes 26seconds) Overview: This video sheds light on where biomass used for bioenergy comes from. The industry makes use of residue and wood that cannot be used in other sectors as a source of energy. As part of sustainable forest management, bioenergy provides energy, rural development, GHG emission reductions and increased forest resilience. **"How Biomass works"** https://www.youtube.com/watch?v=-jln6yi7LF0 (duration 3minutes 23 seconds) Overview: An educational video that aims to explain the basic mechanisms and

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	processes involved in the utilization of biomass for energy production and the biomass cycle. *Reflection: (10 minutes)* After watching the videos, the students correct their answers in the sheet if, after the theoretical part, they noticed or learned something new, with which they self-evaluate their work. After completing this activity, students are encouraged to think about what each individual could and would like to do for a more sustainable biomass cycle. **ACTIVITY 2 (35minutes) : Calculation of moisture content of biomass** ***Theoretical part 1*** *(5 minutes)* The teacher explains to the students that the thermal power and energy efficiency of different types of biomass depends, among other things, on the humidity of the biomass itself, which can be calculated with a formula. *Task 2 (20 minutes)* Using the dry and wet mass value data of several types of biomass and using a formula, each student individually calculates the moisture content of each of the biomasses and completes the individual work sheet (Appendix 2) . *Task 3 (10 minutes)* After completing the calculations for the humidity of the different types of biomass, students discuss which type of biomass is most suitable for processing from an energy point of view, and which one from an environmental point of view.
Assessments	Verbal feedback during class; Conversation with/among students; Monitoring of students during group work; Evaluation of the thoroughness and accuracu of individual work; Each student self-assesses his contribution to the work;
Key Competences	• Cognitive competence • Creativity competence • Communication competence • Social, emotional and healthy living competences • Digital competence
Connections with Eco STEAM	**Eco** - The production and use of biomass other than as a renewable energy source can affect a variety of ecosystem services, including soil fertility and water quality. **S**cience - Fuels, renewable energy sources and their conversion into thermal energy. **T**echnology -Students will learn how biomass combustion plants work. **E**ngineering - Students can design biomass burning plants and waste recycling devices. **A**rt -Students can draw the biomass cycle. **M**ath - Students perform various mathematical calculations to find out the moisture content of different types of biomass.

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References	• Physics textbook for high school education in the Republic of Nort Macedonia • Dr. Ilija J.Petrovski, B.Sc. M.Sc., STEAM BOILERS 2004, Education Skopje • Dr. Emil Zaev, Biomasa 2017, UKIM Skopje • https://www.ea.gov.mk/chesto-postavuvani-prasha%D1%9Aa/za-obnovlivi-izvori-na-energi%D1%98a/
Notes	• Students can apply knowledge of the biomass cycle to propose solutions for waste management and energy production. • Developing strategies to optimize the use of biomass while minimizing the impact on the environment.

APPENDIX 1. STUDENT'S GROUP ACTIVITY SHEET

Research Aspects	Describe the biomass cycle by answering the questions	
What is the process of biomass?		
List at least 4 types of biomass!		
What is the carbon cycle and biomass?		
How does the cycle of biomass energy work ?		
Team members :		

APPENDIX 2. TABLE OF VALUES FOR STUDENT'S INDIVIDUAL WORK

Type of biomass	Mass of freshbiomass (kg)	Mass of dry biomass (kg)
Wood shavings	100	70
Corn straw	200	120
Clover	150	90
Acacia	80	50

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Sugar cane	300	180
Formula for moisture calculation: **Moisture (%) = ((Mass of fresh biomass - Mass of dry biomass) / Mass of fresh biomass) * 100**		

Assessment Table for individual work:

Assessment Criteria	Points	Comments
Understanding the biomass cycle and active involvement in teaching	_/5	
Moisture calculations of biomass types	_/10	
Data analysis and critical thinking	_/5	
Quality of Notes and Comments	_/5	

Assessment Table for group work:

Assessment Criteria	Points	Comments
Internet research skills	_/5	
Clarity in Presentation of Data	_/5	
Understanding the concepts of the biomass cycle	_/5	
Ecological Interpretations and Insights	_/5	
Teamwork and Collaboration	_/5	
Skills of presenting the work	_/5	

1.2.4. ACTIVITY PLAN: TRASH FASHION	
Introduction part (or activity overview)	Creating a trash fashion art class can be a fantastic way to encourage creativity, environmental consciousness, and self-expression.

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Setting	The activities will take place in a classroom equipped with a smart board and computers.
Materials Needed	Various recyclable materials (e.g., cardboard, newspapers, plastic bags, bottle caps, fabric scraps) ● Scissors ● Glue or adhesive ● Tape ● Paint, markers, or other decorative materials ● Sewing supplies (optional, depending on the complexity of designs) ● Mannequins or dress forms (optional, for display)
Learning Outcomes	The specific skills, knowledge, or attitudes that participants are expected to develop or acquire through the activity are: ● Find out about recycling and reusing rubbish ● Care for the environment ● Solve problems creatively ● Learn to create clothes from materials that can be recycled ● Develop creativity and artistic skills; ● Develop the ability to perceive and create and design your own; ● Make a sketch of an object and turn it into a real model; ● Calculate how much material you need for a real model;
Activity Contents	**Activity Steps (**Duration:1-2 hours, depends on the complexity of designs and available class time) **Activity 1-Making fashion items from materials that can be recycled (150 min+45 optional)** **Theoretical part 1: (15 min)** The teacher explains to the students the concept of trash fashion and its significance in promoting sustainability, shows examples of trash fashion designs or wearable art made from recycled materials to inspire students. Videos (examples of school trash fashion): Video 1: https://www.youtube.com/watch?v=lSRMtLfWYs8 duration (4min 55 sec) overview: the video is example of trash fashion show from MIT university students with description of the concept and the purpose of trash fashion Video 2: https://www.youtube.com/watch?v=0sp1F8rcy20 duration (1min 56 sec) Overview: the video is example of trash fashion show organized by a Nigerian NGO. They are hoping to make a difference in people's lives by showing off its delightful designs and outfits fashioned from everyday rubbish. **Task 1: (45 min)** The teacher divides the students into groups of 4 and gives tasks to the students to sketch their designs on paper. Students brainstorm ideas for their trash fashion designs in groups. They sketch their designs on paper and plan the materials they will use. The teacher encourages students to think outside the box and provides students with access to a variety of recyclable materials, they select the materials they will use based on their design plans. **Task 2: (1 hour)**

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	The teacher gives the students a task to start constructing their pieces. Students start constructing their trash fashion pieces based on their design plans. The teacher encourages collaboration - students work in small groups of 4 to create larger-scale fashion pieces, provide guidance and assistance as needed. Also encourage experimentation with different techniques and combinations of materials, adding decorative elements. The teacher reminds them to pay attention to details and aesthetics to enhance the overall appearance of their designs. **Task 3: (30 minutes)** Students showcase their designs to the class, explain their creative process, inspiration, and the materials used, discuss the importance of recycling and sustainability in fashion and art. Students clean up their workspaces and properly dispose of any leftover materials, encourage them to recycle or repurpose materials whenever possible. **Optional activity: Fashion Show or Exhibition (if time allows 45 minutes):** The teacher organizes a mini fashion show or sets up an exhibition to display the student's trash fashion creations, invites other classes, teachers, or parents to attend. **Additional Tips:** ● Consider integrating technology by allowing students to document their design process and final creations through photos or videos. ● Provide examples of famous designers or artists who incorporate recycled materials into their work for further inspiration. ● Emphasize the importance of sustainability and responsible consumption throughout the activity.
Assessments	The teacher evaluates the students' work and achievements through: ● Verbal feedback during class; ● Conversation with/among students; ● Monitoring of students during individual and group work; ● Observation the individual contribution of each student when working in groups; ● Evaluation of students' presentations; ● Highlighting the most elegant and ideal solution or Eco-sustainable house; Each student independently evaluates his contribution to the work. The final score is evaluated with a grade. It is possible to involve all students in the class in the assessment. After the presentations, students conduct oral reflection.
Key Competences	● Cognitive competence ● Creativity competence ● Communication competence ● Social, emotional and healthy living competences ● Citizenship competence ● Digital competence ● Cultural competence
Connections with Eco STEAM	**Eco** - Use of recycled materials for making interesting designs **S**cience - Recognition of different materials in which group they belong, such as plastic, paper,

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	etc . **T**echnology - Students will learn how to apply **E**ngineering - Students will learn to design their own fashion model made by recyclable materials **A**rt - Students will learn to make a sketch of a model and turn it into a real design of dress, shirt **M**ath - Students perform various mathematical calculations to find out how much materials they need from each type
References	• Academic and scientific literature on recycling • Online databases and resources for trash fashion examples
Notes	• The activity should be adaptable to different ages of students • Emphasize safety and ethical behavior during model making

Assessment Table for Group Presentations:

Assessment Criteria	Points	Comments
Comprehensiveness of design	_/5	
Clarity in expression of design idea	_/5	
Uniqueness of a design idea	_/5	
Ecological Interpretations and Insights	_/5	
Teamwork and Collaboration	_/5	
Use of Visual Aids in Presentation	_/5	

1.2.5. ACTIVITY PLAN: LETS GIVE PAPER A SECOND LIFE	
Introduction part (or activity overview)	Every year, the demand for paper increases while the supply of wood, from which it is made, decreases. There are fewer and fewer green spaces, meaning significant harm is being done to the nature around us. If the reduction of green spaces is not controlled, soon the Earth's atmosphere will become almost uninhabitable for nearly all types of life. Therefore, it is important for each of us to learn to treat forests with care and consideration. Using recycled materials for paper production is one of the key solutions to this problem.
Setting	Chemistry classroom - laboratory, mobile phones, interactive whiteboard, computers for student groups to perform the theoretical part.

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	This is a long-term project-based - team and individual work.
Materials Needed	**Materials:** any used paper, water. For paper decoration: seeds, paints, coloring tools (colored pencils, gouache, markers, acrylic paints, and other decorating tools). **Tools:** food processor or blender, larger containers for soaking paper, 2 frames with attached mesh, towel or a larger fabric that absorbs moisture well, sponge.
Learning Outcomes	• Deepen knowledge about sustainable paper production, the use of recyclable materials, and waste minimization in the process of eco-friendly paper production. • Enhance practical skills in making paper from secondary raw materials, identify and collect suitable materials for recycled paper production. • Be able to assess and make responsible decisions on waste management and recycling issues. • Understand the principles of sustainable business regarding eco-friendly and sustainable business models in the paper production sector.
Activity Contents	**Activity1:** Let's give paper a second life. **Theoretical Part (Duration: 15 min.):** Introductory talk - discussion on paper recycling. **Information for the Teacher:** The method of making paper from tree bark, hemp, rags, and fishing nets was invented by Cai Lun (China) about 105 years ago. Plant material was ground in stone mills with water; the liquid pulp was scooped onto a frame stretched with a net, and after the water drained, the remaining layer of intertwined fibers on the net was transferred onto a cloth, pressed to remove remaining water, dried, ironed, and cut. The Chinese kept this paper-making method secret, and only in the year 610 did the Japanese begin to produce paper. In 751, the Arabs adopted the paper-making method from Chinese prisoners (rags were boiled in cauldrons with lime, soaked, and ground in mills). Such material for making paper was used until the 19th century. Paper is most often made from coniferous and deciduous fiber, rags, waste paper. In addition to fibrous material, crushed mineral substances (fillers), adhesives, and dyes are added. The properties and purpose of the paper are determined by the raw material, fillers, additives, and production technology. **Task 1 (Duration: 30 min.):** Step 1: Students discuss questions such as: 1. How can paper be recycled? 2. True or myth that sorting consumes more energy than it saves? 3. Do they know how to correctly sort used paper boxes? 4. Is glossy magazine paper sorted? 5. Could sorting help reduce waste? Step 2: Students, divided into groups of 3-4, use digital sources to look for information. Step 3: Summarize and prepare a presentation using Microsoft PowerPoint, Padlet, Canva, Movie Maker (film creation), or another presentation program. **Task 2:** Making Recycled Paper from Used Paper

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Theoretical Part (Duration: 10 min.): Introductory talk, the teacher explains how to make paper from various paper wastes – this is the secondary use of paper, related to ecology. Homemade paper can be used for decorations, postcards, labels, letters, or other art works.

Task (Duration: 80 min.):

Step 1: Students work individually, at the start of the work they view filmed material about paper making.

Videos:
https://www.youtube.com/watch?v=fcjiuSD7TF

o Duration: Approx. 2.22 minutes

https://www.youtube.com/watch?v=TAH2IDs6D

Yw Duration: Approx. 3.18 minutes

Step 2: Gather the necessary tools for the work.

Step 3: Cut the paper into small pieces. Various types of household-used paper will do: packaging, paper bags, etc.

Step 4: Pour water over the shredded paper and leave it to soak for at least a few hours, ideally overnight.

Step 5: Place the soaked paper into a food processor and blend until it reaches a uniform consistency. Step 6: Transfer the resulting mixture into a large container and add water.

Step 7: Using a frame with mesh (you can make one yourself from a picture frame), capture the paper pulp.

Step 8: Flip the frame onto a dry cloth, but don't lift it yet! Use a sponge or a highly absorbent cloth to dry the future paper, then carefully remove the frame.

Step 9: Leave it to dry for about a day.

Step 10: Afterwards, keep it under books or heavy objects for another day.

Task 3: Decorating the Made Paper.

Theoretical Part (Duration: 10 min.): The teacher explains the requirements for the work description, what to pay attention to. They suggest looking for ideas on how to use the homemade paper by
searching digital sources.

Task (Duration 90 min.):

Step 1: Each student plans what they will do with the made paper, decorates it, and adapts it for a "second" life.

Step 2: Prepares a work description in the "Word" program according to the following requirements:

- Introduction (topic relevance, practical work significance, goal or idea, its relevance);
- Project progress (description of the work process with photos);
- Project results and their analysis;
- Conclusions;
- List of literature and information sources;

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	• Self-evaluation; • Appendices (if any). Step 3: Presents the work.
Assessments	Each student evaluates their work according to the provided Appendix 1. Each student presents the results of their work, assesses successes and failures, and performs an oral reflection. The final result is graded. All students in the class are included in the evaluation.
Key Competences	• Cognitive competence • Creativity competence • Communication competence • Social, emotional and healthy living competences • Citizenship competence • Digital competence • Cultural competence
Connections with Eco STEAM	Eco - selection and investigation of environmentally friendly materials. Science - knowledge in biology, chemistry, economics, and environmental sciences. Technology – use of digital tools. Engineering – paper production from secondary materials. Art - creative solutions that encourage sustainable thinking and aesthetics. Math - application of mathematical calculations.
References	https://www.vle.lt/straipsnis/popierius/ Links about paper making: https://www.klaustukai.lt/kaip-pasigaminti-popieriu/ https://www.skiautinukas.lt/archyvai/880
Notes	

APPENDIX 1. EVALUATION/SELF-ASSESSMENT

Skills in performing theoretical and practical questions	I am very good, excellent	I am good	I am satisfactory	What I didn't understand/couldn't do and what I would need to learn more about
1. Formulate the hypothesis, objectives, and tasks of the practical work				
2. Create a plan for the practical work				

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3. Independently perform the practical - creative work				
4. Evaluate the obtained results				
5. Formulate conclusions and present the work				

1.3. SUBTOPIC. WASTE MANAGEMENT AND RECYCLING

1.3.1. ACTIVITY PLAN: BIOMASS - RENEWABLE SOURCE OF ENERGY	
Introduction part (or activity overview)	Deepen student's understanding of biomass as a renewable energy source and how environmental waste can be used to produce thermal energy. The activities will initiate students to think and discuss the pros and cons of biomass as a source of energy and investigate which waste from their environment can be economically and energetically most suitable for biomass, thus developing a critical opinion, independently making decisions and feel useful to society with their work.
Setting	Classroom
Materials Needed	Computer (phone or tablet can be used to collect information), video presentation equipment, flip charts, markers
Learning Outcomes	• Understanding the ways in which biomass can be converted into thermal energy • Initiating a discussion about the pros and cons of biomass as an energy source • Researching which waste from their environment can be economically and energetically most suitable for biomass • Developing a critical opinion, independent decision-making and developing a sense of responsibility towards society. • Recognizing the environmental impact of traditional energy sources and the need for sustainable alternatives.
Activity Contents	**ACTIVITY 1 (40minutes): Pros and cons of using biomass as an energy source** ***Theoretical part 1 (10minutes)*** The teacher explains the ways in which biomass is converted into thermal energy (burning, briquetting, rotting, fermentation). Video material about the processes of converting biomass into energy is attached: Video: **"Journey to the heart from energy – How a biomass power plant works"** https://www.youtube.com/watch?v=40ztd8uoU9Q (duration 2minutes 06 seconds) Overview: An educational video designed to discover how a biomass power plant works. In a biomass power plant, electricity is generated using the heat produced by the combustion of organic materials, such as plant residues, household waste and biogas. Video: **"Biomass pyrolysis process"** https://www.youtube.com/watch?v=3K1zWAYDvMA (duration 3minutes 58 seconds)

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Overview: An educational video about biomass pyrolysis process. Wooden or agricultural biomass is treated with high temperatures. That process results in quick concentration of elemental carbon and disappearance of the fibrous structure improving its grindability. To maximize efficiency of pyrolysis process flue, gases cool down in the heat exchanger.

Task 1 (10 minutes)

The students comment on the advantages and disadvantages of each method from an economic and environmental point of view. Through conversation and individual statements, students exchange knowledge and opinions.

Task 2 (20min)

- Students divide into 4 groups and discuss the pros and cons of using biomass as an energy source. They write down the common views on flip charts, separating the pros and cons in two columns. Students can research information about the topic using digital resources.
- After that, one student from each group reads the notes from flip charts previously placed in visible places in the classroom.

ACTIVITY 2 (60minutes): Researching which waste can be economically and energetically most suitable for biomass

Theoretical part 1 (10min)

The teacher explains to the students that the main disadvantages of biomass are the large amount of moisture it contains and the low energy value per unit mass, which is why biomass is processed to obtain a suitable form for transport and storage.

Video: **"Biomass drying containers"**

https://www.youtube.com/watch?v=VnkeFps8VIA (duration 2min 29s)

Overview: An educational video about the process of drying the biomass, which means the reduction of the moisture content in the combustion material in biomass boilers

Task 1 (30min)

- Each student is given the task to individually analyze and compare two types of biomasses that can be found in the students' environment: grape stalks as waste from pruning vineyards on an area of 2250ha and waste from an area under corn on an area of 1500ha.
- Data on the technical potential and thermal power of each of the biomasses as well as the energy efficiency formula are given in the study sheet (Appendix 1).
- Students calculate the cost of transporting an appropriate amount of biomass for a 100km(about 62.14 mi) distribution (to a potential plant for converting biomass into thermal energy)

Task 2 (20 min)

The correct calculations that the students should have got are given on the smart board, students compare them with their own calculations and self-evaluate. Students discuss and come to a

conclusion whether a plant with a drive to convert biomass into heat energy should be built in

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	the surroundings of their city, also which would be energetically and economically more profitable.
Assessments	Verbal feedback during class; Conversation with/among students; Monitoring of students during group work; Evaluation of the thoroughness and accuracy of individual work; Each student self-assesses his contribution to the work;
Key Competences	• Cognitive competence • Creativity competence • Communication competence • Social, emotional and healthy living competences • Digital competence
Connections with Eco STEAM	**Eco** - Biomass is a renewable energy source, and in addition, by converting waste materials into energy, biomass helps reduce landfill use and methane emissions. Science - Fuels, renewable energy sources and their conversion into thermal energy. Technology - Students will learn how biomass combustion plants work. Engineering - Students can design biomass burning plants and waste recycling devices. Art- Students can draw the types of biomasses and the process of converting it into energy. Math - Students perform various mathematical calculations to find out the energy efficiency and transport costs of different types of biomasses.
References	• Physics textbook for high school education in the Republic North Macedonia • Dr. Ilija Petrovski, B.Sc. M.Sc., STEAM BOILERS 2004, Education Skopje • Dr. Emil Zaev, Biomasa 2017, UKIM Skopje • https://www.ea.gov.mk/chesto-postavuvani-prasha%D1%9Aa/za-obnovlivi-izvori-na- energi%D1%98a/
Notes	• Students can apply the knowledge of biomass to energy conversion and the research they have done to propose solutions for waste management and energy production, specifically to propose a location for plants in which biomass from their environment will be converted to energy. • Developing strategies to optimize the use of biomass while minimizing the impact on the environment. • Different types of biomasses can be chosen from those proposed for calculations and analysis depending on what type of waste (biomass) is most prevalent in your environment.

APPENDIX 1. STUDENT'S ACTIVITY SHEET

BIOMASS DATA				
Type of biomass	**Area**	**Annual income per hectare**	**Technical potential**	**Thermal power (Tm)**

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Grape stalks as waste from pruning	**2250 ha**	**3t**	**60%**	**11500 kJ/kg**
vineyards				
Waste from an area under corn	**1500 ha**	**10t**	**20%**	**16500 kJ/kg**

Research Aspects	**Answers for grape stalks biomass**	**Answers for corn waste**
1.Energy efficiency? Calculate energy efficiency according to the formula: **En=m*Tm**		
2.Sustainability? Is this type of biomass obtained in a way that is sustainable and does not lead to the destruction of natural resources?		
3.Technological aspects? Which type of technology is most suitable for the utilization of both biomass ?		
4.Transportation aspects? Calculate the transport costs for the corresponding quantities of biomass for a distance of 100 km.		

Student's name and surname:

You can use internet research to answer the questions!

Assessment Table for individual work:

Assessment Criteria	**Points**	**Comments**
Energy efficiency calculations of biomass types	_/10	
Transport costs calculations	_/10	
Data analysis and critical thinking	_/5	
Quality of Notes and Comments	_/5	
Internet research skills	_/5	
Skills in making conclusions and decisions	_/5	

Assessment Table for group work:

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Assessment Criteria	Points	Comments
Understanding the ways in which biomass is converted into thermal energy	_/5	
Determination the pros and cons of using biomass as an energy source	_/5	
Skills of presenting the work	_/5	
Ecological Interpretations and Insights	_/5	
Teamwork and Collaboration	_/5	
Skills of presenting the work	_/5	

1.3.2. ACTIVITY PLAN: CREATING A POSTER FOR THE IMPACT OF CLIMATE CHANGE ON THE ENVIRONMENT	
Introduction part (or activity overview)	This session is designed to deepen students' understanding to create visually impactful posters that raise awareness about the effects of climate change on the environment. By following this activity plan, you can empower your students to use their artistic skills to raise awareness about the urgent issue of climate change and its impact on the environment.
Setting	Classroom complemented by digital research.
Materials Needed	• Poster boards or large sheets of paper • Markers, colored pencils, or paints • Reference materials (books, articles, websites) about climate change and its impact on the environment • Printouts of relevant images or graphics (optional) • Glue or adhesive (if using printed images)
Learning Outcomes	• Developing deep understanding about climate change and its impact on the environment; • Improving proficiency in expressing an opinion about a certain phenomenon through a drawing; • Enhancing skills in digital research and data analysis; • Improving ability to critically analyze and discuss about climate change and its impact on the environment;
Activity Contents	**Activity1 Steps** (Duration: 2-2.5 hours, depends on the complexity of designs and

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available class time)

Activity (Designing a poster) Theoretical part 1: (20 minutes): The teacher explains to student's what climate change and its impact is on the environment and gives examples of environmental changes.

Students watch short videos:

Video 1: https://www.youtube.com/watch?v=G4H1N_yXBiA

Duration:(3min 6 sec)

Overview: Climate change refers to long-term shifts in temperatures and weather patterns. Human activities have been the main driver of climate change, primarily due to the burning of fossil fuels like coal, oil and gas.

Video2: https://www.youtube.com/watch?v=G9t_9Tmwv4

Duration: (5min 55 sec)

Overview: What is climate change and how to deal with climate change?

Task1: (30 minutes)

Teachers brainstorm ideas from students for their posters, conduct research to gather facts, statistics, and images.

The teacher divides the students into groups of 4. The teacher gives an assignment to the students to sketch out their poster designs, encourage them to include impactful imagery, concise text, and effective use of color to convey their message.

Task2: (60-80 minutes)

Students begin creating their posters, using poster boards or large sheets of paper markers, colored pencils, or paints to bring their designs to life,

Teachers encourage creativity and experimentation with different techniques and styles, encourage incorporating key messages about the impact of climate change on the environment, but also compelling text and captions to accompany visual elements.

The teacher provides feedback and guidance to students as they work on their posters, encouraging peer feedback and collaboration.Students add any final touches or details, review their posters and make any necessary adjustments.

Task 3: (30 minutes)

Students present their work to the class; explain their design choices and the messages they aimed to convey. Discussion about the importance of raising awareness about climate change and the role of art in advocacy.

The teacher helps students to display the completed posters around the school or in a public area to share the students' messages with a wider audience. Students share theposters on social media or submit them to local environmental organizations or events.

Additional Tips:

The teacher should provide examples of effective posters about climate change to inspire students and illustrate different design approaches.

The teacher encourages students to use their own voice and perspective to create unique and impactful posters and emphasizes the importance of accurate information and factual content in conveying the seriousness of climate change.

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Assessments	• Assessment of Web Quest reports for depth of research and understanding. • Evaluation of the thoroughness and accuracy of field observation records. • Group presentations synthesizing fieldwork findings, with a focus on climate change and the impact on the environment
Key Competences	• Cognitive competence • Cultural competence • Creativity competence
Connections with Eco STEAM	**Eco**- using their artistic skills to convey a message about the seriousness of the impact of climate change on man and nature **S**cience - ecological science (study of the impact of climate change on biodiversity in nature) **T**echnology- use of digital tools for research **E**ngineering -thinking in the future to use alternative sources of energy in order to reduce the impact of man on nature **A**rts -designing poster by their own **M**ath - data analysis about the impact of climate change on biodiversity
References	• Academic and scientific literature on the impact of climate change, ecosystems, and prevention • Online databases and resources for the impact of climate change on animals, plants, human health
Notes	• In different areas or countries in the world, the impact of climate change is different • Encourage students to use examples from their immediate environment • Encourage students to reflect on their role in reducing the human impact on climate change by using renewable energy sources

Assessment Table for Web Quest Reports:

Assessment Criteria	Points	Comments
Depth of Research	_/5	
Understanding of climate change impact	_/5	
Accuracy of Information	_/5	
Quality of Presentation	_/5	
Use of Visuals	_/5	

Assessment Table for individual Presentation:

Assessment Criteria	Points	Comments
Comprehensiveness of Findings	_/5	

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Clarity in Presentation of Data	_/5	
Understanding of climate change impact	_/5	

Ecological Interpretations and Insights	_/5	
Clarity of design in expressing the problems caused by climate change	_/5	
Use of Visual Aids in Presentation	_/5	

1.3.3. ACTIVITY PLAN: IMPACT OF RENEWABLE ENERGY ON CLIMATE CHANGE	
Introduction part (or activity overview)	This activity is designed to deepen students' understanding of the crucial role renewable energy plays in combating climate change. Through detailed analysis and practical project planning, students will explore the science of climate change, assess various renewable energy technologies, and propose actionable renewable energy projects tailored to their local contexts.
Setting	Location: Classroom equipped with computers, internet access, and multimedia capabilities. Educational Context: Collaborative group work (2-3 students per group).
Materials Needed	Computers with internet access Projector and screen for video presentations Art supplies including paper, markers, and colored pens for creating diagrams and charts Access to scientific journals and databases for research
Learning Outcomes	• Gain a comprehensive understanding of the causes and impacts of climate change. • Evaluate different renewable energy sources for their environmental benefits and practical applications. • Design and present a detailed proposal for implementing a renewable energy solution in the community.
Activity Contents	**Theoretical Part (Duration: 70 minutes)**: Begin with an in-depth discussion on climate change, emphasizing its global impacts, scientific basis, and the urgency of mitigating actions. Transition into how renewable energy technologies play a pivotal role in reducing greenhouse gas emissions and supporting sustainable development. • **Key Concepts Covered**: o Greenhouse gases and their sources o Impact of fossil fuels on climate change

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	o Benefits of transitioning to renewable energy ● **Video Resources**: o "The Science of Climate Change Explained" (https://www.youtube.com/watch?v=exampleLink1) – A detailed explanation of the scientific principles of climate change. o "How Renewable Energy Can Reshape Our Future" (https://www.youtube.com/watch?v=exampleLink2) – An overview of various renewable energy technologies and their potential to combat climate change. **Task 1: Renewable Energy Analysis (Duration: 80 minutes) Step 1**: Each group selects one type of renewable energy (solar, wind, hydro, geothermal, or biomass). They conduct extensive research on its principles, efficiency, global implementation status, and local applicability. **Step 2**: Develop a comprehensive report that discusses: ● Detailed description and workings of the selected technology. ● Environmental impact, focusing on emission reduction and ecological footprint. ● Economic analysis including cost, return on investment, and potential for job creation. ● Real-world examples where this technology has successfully made a significant impact. **Step 3**: Groups use a presentation tool to organize their findings visually and persuasively, readying themselves for a classroom presentation that fosters a comparative discussion on the feasibility and scalability of these technologies. **Task 2: Renewable Energy Project Proposal (Duration: 70 minutes) Step 1**: Identify an environmental issue or opportunity in the community that can be addressed with the chosen renewable energy technology. Consider factors like local climate, geography, and economic conditions. **Step 2**: Outline a detailed project proposal that includes: ● Specific objectives and expected outcomes (e.g., reduction in carbon emissions, energy generated). ● Detailed plan for technology implementation including site selection, scale of the project, and technological requirements. ● Stakeholder analysis and community involvement strategies. ● Budget estimation and funding strategies, exploring potential grants, subsidies, and partnerships. ● Project timeline and milestones. **Step 3**: Each group presents their proposal using digital slides, engaging the class in a discussion about the practicalities, potential challenges, and impact of their proposed projects.
Assessments	Depth and accuracy of technical and environmental analysis. Innovation and practicality in project design. Quality and persuasiveness of presentation. Engagement and critical thinking demonstrated during class discussions.
Key Competences	Comprehensive scientific understanding Critical analysis and strategic planning Effective communication and presentation skills

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	Collaborative problem-solving
Connections with Eco STEAM	Eco and Science: Understanding environmental science and ecological impact assessments. Technology and Engineering: Application of technological solutions to real-world environmental problems. Arts: Creative expression in the presentation and visualization of data. Math: Statistical analysis and financial planning for project feasibility
References	Intergovernmental Panel on Climate Change (IPCC) Reports - https://www.ipcc.ch/reports/
Notes	Consider extending this activity into a longer-term project, allowing students to interact with local environmental agencies or energy companies for real-world insights and potential mentorship.

Evaluation Table No. 1.

Evaluation Criteria	Points	Comments
Student's contribution to the work	_/2	
Completeness of the report	_/5	
Presentation	_/5	
Advertisement created	_/5	

1.3.4. ACTIVITY PLAN: SOLAR POWER PLANT FOR MY FAMILY	
Introduction part (or activity overview)	This activity is designed to engineer a solar energy system tailored specifically to the energy needs of the students' families. By examining the structure of solar power plants, installation steps, and financial expenses, they will gain valuable knowledge about renewable energy and contribute to a more sustainable future for their households.
Setting	Classroom
Materials Needed	Digital devices (tablets/laptops) Projector/interactive whiteboard
Learning Outcomes	• Increase understanding of solar energy and its application in residential environments. • Acquire practical skills in designing a solar power plant. • Analyze energy consumption patterns, assess property suitability, and make informed decisions about system design, budgeting, and component selection, thereby strengthening their critical thinking and decision-making skills.
Activity Contents	**Activity 1: Solar Power Plant for My Family** **Theoretical Part** (Duration: Approx 25 minutes). This activity will start with an interesting and detailed examination of how solar cells work, the principles they are based on, and their advantages and disadvantages. It's important to consider what factors can influence the

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	efficiency of solar energy. **Videos:** How do solar panels work? https://www.youtube.com/watch?v=xKxrkht7CpY Overview: This video simply explains the operation of a solar cell, the advantages, and disadvantages of solar energy. Duration: 5 minutes How do solar panels work for your home? https://www.youtube.com/watch?v=ZzCjZb8mFwM Overview: This video explains how to install a solar power system at home. Duration: 1.18 minutes **Task (Duration: 180 minutes):** Students, working individually, design a solar power plant for their family. **Step 1.** Using the information found at these links, they fill out an information collection sheet (see attachment). (Duration: Approx 45 minutes) https://energijaman.lt/naujienos/saules-elektrines-irengimas/ https://energijaman.lt/naujienos/parama-saules-elektrinems-lietuvoje/ https://energijaman.lt/naujienos/saules-moduliai/ https://www.elektrum.lt/lt/namams/naujienos/naujienos/saules-elektrines-atsiperkamumas-ka-butina- apie-tai-zinoti https://energijaman.lt/naujienos/saules-elektrine-koki-gaminancio-vartotojo-atsiskaitymo-buda- pasirinkti/ **Step 2**. Using the information collection sheet, they prepare a presentation (slides) (Duration: Approx 45 minutes) **Step 3.** They present their project to the class. (Duration: Approx 90 minutes)
Assessments	Presentation Evaluation Table (see appendix)
Key Competences	• Cognitive competence • Creativity competence • Communication competence • Digital competence • Cultural competence
Connections with Eco STEAM	Eco - solar energy as a sustainable alternative to traditional energy sources Science – physics, geography. Technology - Conversion of solar rays into electrical energy Engineering – to create and install a solar energy system

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	Art – solar power plant design and creative project presentation Math - calculate energy needs, installation costs, and assess the economic efficiency and return of the project.
References	https://www.youtube.com/watch?v=L_q6LRgKpTw How do Solar cells work?
Notes	• The links provided in the task may not meet the requirements of another country for building a solar power plant. • If there is a lack of time, it is possible to skip the presentations and only evaluate the information collection sheet.

APPENDIX

INFORMATION COLLECTION SHEET

Task	Answer
Find out how much electricity the family uses per year and calculate how much it costs.	
Calculate the required power of the power plant.	
Determine where your family can build a solar power plant.	
Find out what kind of support can be obtained from the state for building a solar power plant.	
Identify the main components needed for the solar power plant.	
Calculate the installation cost of the Solar Power Plant.	
Learn how to connect the solar power plant to the electricity grid, or whether to use a battery.	
Calculate how long it will take for the Solar Power Plant to pay for itself.	

PRESENTATION EVALUATION TABLE

Evaluation criteria	Points	Comments
Completeness of information	_/4	

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Correctness of information	_/2	
Quality of Presentation	_/2	
Slide quality	_/2	

1.4. SUBTOPIC. CLIMATE CHANGE AND RENEWABLE ENERGY

1.4.1. ACTIVITY PLAN: ECO-SMELL CAR FRESHENERS

Introduction part (or activity overview)	Implementing this activity helps to reduce the environmental footprint of paper and move towards a more sustainable future. The tasks are supposed to promote high ecological values with combination of scientific knowledge and practical skills; students engage in making innovative models for daily life, fostering creativity among the students with green technologies.
Setting	Classroom equipped with digital equipment (computers, laptops, tablets or smart phones) and working classroom
Materials Needed	Various natural materials (e.g. peels from banana, orange, pomegranate, tangerine, lemon etc. or flower leaves from roses, lavender, chamomile, mint etc.) ● Unflavored gelatin powder (Alternatives: Arow root powder or Carbopol), fragrance, table salt, food colors, boiled distilled water, silicon molds, moulding white powder, spoons, bowls, acrylic paint, brushes, jars, wax, plaster, glue, magnets, essential oils, wool or old clothes, baking soda, seeds from plants and a lot of paper. ● Students could try different materials if they make the research previously with authorization of the teacher.
Learning Outcomes	● Understanding the concept of using old home materials and making the best use of them. ● Replacing plastic accessories in the car that cause harm to the environment after their initial use and creation of green technologies. ● Enhancing skills in digital research and data analysis. ● Improving ability to critically analyze and discuss the importance of using natural seeds and scents to preserve the environment.
Activity Contents	**Activity: Eco smell car fresheners** **Activity Steps – (**Duration: 1-2 hours for production of the fresheners and cleanup) **Theoretical part:** (Duration: 10 minutes) – Students explore the usage of printed paper across various sectors (education, business, government), emphasize the essence of paper as a tool for communication and documentation, and how its extensive use poses significant environmental challenges. This theoretical analysis explores the environmental impact of high paper usage and suggests measures to mitigate these effects. Students discuss different ideas for reusing the paper for eco purposes.

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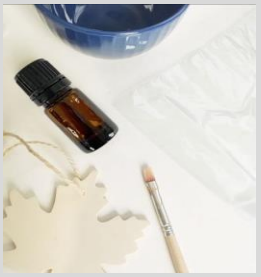
Task 1. Making car air fresheners by blending old and unusable paper (30 minutes):

- Students blend old paper with a little water, gelatin and drops from essential oils or dried peels from fruits and flower leaves. When a thick and homogenous mixture is obtained, fruit seeds are placed in it. In the meantime, molds for the mixture are being prepared which can be made from thicker cardboard, plastic or straws. They can choose different math shapes to experiment with.
- Students choose the flowers and fruits they are most interested in from the Materials Needed section.
- Students pour the mixture into the mold and let it harden. Then, they can begin the process of decorating and art approach for the fresheners. They can produce creative designs that will be attractive for buying this kind of crafts. As a string for these decorations natural wool ropes or thread can be used. After the odor from the air fresheners has subsided and disappeared the same fresheners can be placed in the ground to possibly sprout a new plant.





Task 2. Constructing and fashioning process (60 minutes):

- Students do research on the Internet and come up with ideas for creating a new car freshener different than the one in Task 1. The teacher gives interesting videos suggestions to the students, but they have the free will to search for different ideas than the ones the teacher suggested.

Videos for creating different car (air) fresheners:
https://www.youtube.com/watch?v=IIWy81ixSh4 (Duration: 5:40)
https://www.youtube.com/watch?v=q0IysQXiF-E (Duration: 0:29)
https://www.youtube.com/watch?v=r_JoHE3NpU8 (Duration: 16:44)
https://www.youtube.com/watch?v=4B4OjLebkRc (Duration: 9:12)
https://www.youtube.com/watch?v=D-d_30MhkOY (Duration: 2:36)
https://www.youtube.com/watch?v=IwHjqpgwJ8Q (Duration: 0:47)

- Students previously are informed to bring the materials for this lesson.

Task 3. Evaluation and reflection, cleanup (20 minutes):

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	• Once the fresheners are created, students evaluate their results and reflect on the designing action, the effectiveness of the activity, and any challenges experienced during the task. • Students clean up their workspaces. **Additional Tips:** • Students research chemistry and biological properties of some plants to create pleasant car air freshener. • Use the air fresheners, as hand-made products by the students, in the school's toilets • Making air fresheners with the logo of the school. • Testing the life of air fresheners.
Assessments	• Assessment of Web Quest reports for depth of research and understanding. • Evaluation of the thoroughness and accuracy of practical observation records. • Group presentations synthesizing practical inventions, with a focus on which method is the most sustainable, which design is the most creative and efficient, etc.
Key Competences	• Cognitive competence • Creativity competence • Communication competence • Social, emotional and healthy living competences • Citizenship competence • Digital competence • Cultural competence
Connections with Eco STEAM	**Eco** – Reducing printed waste paper, using natural seeds, fragrances and essential oils, planting new plants and spreading environmental awareness. **S**cience – interdisciplinary knowledge from chemistry and biology (producing smell of natural scents and selection seeds from biology lessons). **T**echnology – use of digital equipment for research, use of software for providing a financial plan (MS Excel). **E**ngineering – the unique process of designing the car fresheners improves students creativity. **A**rts - developing creativity through the use of natural materials, scents, seeds and colours for these car crafts. **M**ath – measurments about the process of forming the car fresheners, preparation of a financial plan for a possible business company with the specified activity, picking option for mathematical shapes, and generating molds and hollow containers used to give shape to molten liquid materials when it hardens.
References	• Academic and scientific literature on about essential oils, how plants are to extract the fragrance and the seedsfrom them. • Online databases and resources for inventing DIY car air fresheners.
Notes	• The workshop is applicable in every school organization. • Focus attention on safety during the modeling.

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	• Motivate students to develop their own green business sustainable idea.

Assessment Table for Web Quest Reports:

Assessment Criteria	Points	Comments
Depth of Research	_/5	
Understanding of natural seeds and smells	_/5	
Accuracy of Information	_/5	
Quality of Presentation	_/5	
Use of Visuals	_/5	

Assessment Table for Group Presentations:

Assessment Criteria	Points	Comments
Comprehensiveness of Findings	_/5	
Clarity in Presentation of Data	_/5	
Understanding the methods of making the car freshener	_/5	
Ecological Interpretations and Insights	_/5	
Teamwork and Collaboration	_/5	
Use of Visual Aids in Presentation	_/5	

1.4.2. ACTIVITY PLAN: MAKING VASES OR PLATES USING THE PAPIER-MÂCHÉ TECHNIQUE	
Introduction part (or activity overview)	This activity will help students develop responsible and sustainable attitudes towards the environment and creative work. By creating products and interior details from recycled paper using the papier-mâché technique, students not only learn about sustainability but also enhance their creative and design skills. It is a great opportunity to promote sustainability awareness within the community. Waste sorting is an important step towards reducing environmental pollution and contributing to sustainability.
Setting	Classroom

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Materials Needed	Advertising brochures, newspapers, colored posters. Scissors, brushes, paper cutters, PVA glue, flour, water. Latex gloves, plastic wrap, plates or bowls of various shapes (if making plates), balloons (if making vases). Paint (acrylic or gouache).
Learning Outcomes	Increase awareness of how to reduce waste and use recycled materials. Develop creativity and design skills, experimenting with colors, shapes, and textures. Understand how to recycle paper and use it to create new products. Teach the papier-mâché technique and create unique vases or plates. Strengthen sustainable consumption habits.
Activity Contents	**Activity1:** Used paper - the main material in the papier-mâché technique. Vase making using the papier-mâché technique. **Theoretical part (Duration: 20 minutes):** Discussion about sustainability and the importance of reducing waste. Using recycled paper in the creative process. Explanation of what the papier-mâché technique is and showing examples. Introduction to the papier-mâché technique by watching video material. **Videos:** Create Perfect Paper Mache Paste In Just Minutes: https://www.youtube.com/watch?v=iskrKghn5P8 Duration: Approx. 3.00 minutes How To Make Paper Mache Clay In Minutes! https://www.youtube.com/watch?v=7pnqa7FVN28 Duration: Approx. 8.32 minutes Discuss both papier-mâché methods suitable for making plates or vases. **Task (Duration: 90 minutes):** Create a vase or plate using the papier-mâché technique by gluing strips of paper onto the chosen form. Step 1. Idea search and selection. Students search for ideas online, draw sketches, and choose the most appealing idea. They select methods and materials to implement their ideas. Various vases or plates created using the papier-mâché technique (ideas for the teacher and students): https://www.pinterest.com/search/pins/?q=paper%20mache%20vazel%C4%97s&rs=typed https://www.pinterest.com/search/pins/?rs=ac&len=2&q=paper%20mache%20plates&eq=paper%20m ache%20plates&etslf=11041

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	Step 2. Creative process. To make a plate or vase, you can use paper pulp or glue paper strips onto a form. Workflow: Prepare the glue mixture (PVA glue and water). Choose balloons or bowls. To make it easier to remove the product from the form, cover the form with plastic wrap first. Cover the balloons or bowls with paper strips using the glue mixture.Ensure several layers are applied for sturdiness, then leave to dry overnight or until the next lesson. Once dried, carefully remove the balloon or plate form from the papier-mâché product. If needed, trim the edges to make them even. Paint and decorate the vases or plates according to your creative ideas. Step 3. Finishing the vase or plate. Evaluate and reflect on the completed product, discussing any difficulties and the experience gained. Optionally, organize a photoshoot of the created product.
Assessments	Evaluation and Self-Assessment Criteria (Annex 1) The created product (plate or vase) is evaluated with points. For evaluation, you can use the table (Annex 1).
Key Competences	Creativity competence Digital competence Cognitive competence Communication competence Cultural competence
Connections with Eco STEAM	Eco - The vases or plates are created from sorted and recycled materials. Science - The creation process can promote interdisciplinary learning (biology, physics, or chemistry). Technology - Exploring new methods of recycling materials, reducing waste, or using energy-saving technologies. Engineering – The importance of a sustainable lifestyle by broadly utilizing material recycling in daily life. Art - Creating vases or plates fosters creativity and self-expression, and develops aesthetic taste. Math- Engineering, technological, and mathematical calculations are involved.
References	https://lt.wikipedia.org/wiki/Atliek%C5%B3_tvarkymas https://shidokan.lt/atlieku-rusiavimo-taisykles/

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https://www.pinterest.com/pin/70437488787791/ The process of making a bowl

Instead of paper, you can also use old fabrics.
https://www.pinterest.com/pin/270004940154685315/



https://www.pinterest.com/pin/67976275630626793/

Notes	

Annex 1

Evaluation and Self-Evaluation Table

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Evaluation criteria:	Points	Comments
Innovation and creativity	_/5	
Use of materials and sustainability	_/5	
Aesthetics and visual appeal	_/5	
Technical implementation	_/5	
Presentation	_/5	

1.4.3. ACTIVITY PLAN: CREATING A SUSTAINABLE LIVING BUDGET	
Introduction part (or activity overview)	This activity is designed to deepen students' understanding of creating a sustainable living budget, aimed at balancing personal finances in a way that considers not just personal well-being, but also the welfare of the environment and society. The budget will be developed based on sustainability principles, promoting eco-friendly and socially responsible financial decisions.
Setting	Classroom.
Materials Needed	Notebooks and pens Computer Internet
Learning Outcomes	• Improve financial literacy: gain an understanding of income and expense management principles, how to create a budget, save money, and plan for the future financially. • Understand the concepts of environmental, social, and economic sustainability and how to integrate them into your budget creation. • Learn to creatively plan your financial activity, identify goals, and set priorities to create a sustainable budget. • Enhance skills in solving financial challenges and problem situations that may arise while creating and implementing a budget. • Learn to communicate and collaborate with others, share ideas and strategies during the budget creation process, and be able to clearly present your thoughts and argue your positions.
Activity Contents	**Activity1: Creating a Sustainable Living Budget.** **Task 1. Insight into the importance of a sustainable living budget.** **Theoretical part (Duration: 10 minutes):** It is explained that a sustainable living budget is a financial plan that considers not only individual financial goals but also aspects of environmental sustainability. This budget is designed not only to manage income and expenses efficiently but also to reduce one's ecological footprint and contribute to the preservation of the environment.

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There are several important reasons why it is crucial to create a sustainable living budget:

Environmental Preservation: A sustainable living budget helps reduce an individual's ecological footprint, as it encourages conserving energy, water, reducing waste, and choosing environmentally friendly products and services. A smaller ecological footprint contributes to the overall preservation of the environment.

Promotion of Personal Financial Well-being: A sustainable budget helps manage income and expenses more efficiently, reducing the amount of unnecessary expenses and encouraging savings. This allows for better financial future planning, accumulating savings, and reducing financial stress.

The sustainable living budget aims to balance financial well-being with the principles of ecological consciousness, encouraging people to create long-term and environmentally friendly financial habits.

Task 2. Fundamentals of Budget Planning

Theoretical part (Duration: 20 mins): When creating a budget, it's important to assess all sources of income: salary, investments, interest, rental income, state benefits, and other types of income. A thorough determination of income will help understand how much can be spent and saved.

In budget planning, all expenses must be anticipated: necessary (financial obligations, food, housing costs, transportation, healthcare) and unnecessary (e.g., entertainment, travel, luxury goods).

In planning a budget, key personal, financial, and ecological goals that you want to achieve with your budget are identified. These could include long-term savings, debt repayment, a more ecological lifestyle, etc.

When creating a sustainable budget, energy costs at home should be evaluated, and ways to reduce them considered, for example:

Use energy-saving devices, regulate home temperature, use solar energy, etc.

Use water-saving measures: flow regulators, eco-friendly showerheads, collect rainwater for the garden, etc.

Reduce waste: recycle items, buy less packaging, switch to reusable products and packaging.

The budget is a plan of income and expenses, so when creating a budget, it is necessary to plan where money will be spent. When choosing products, their ecological footprint should be assessed, e.g., opt for recycled and renewable resources, eco-friendly products that are less harmful to the environment. Efforts should be made to reduce transportation costs, e.g., use public transport, cycle, choose eco-friendly cars.

An important part of the budget is saving. A sustainable budget includes an autonomous savings plan, where a portion of income is automatically transferred to a savings account or invested in sustainable investments to gradually accumulate savings.

After creating a budget, it is important to monitor it: track expenses and income using budget tracking apps or tools that help understand where most money is spent and how to manage the budget more efficiently.

5 Best Personal Finance Planning Apps [Link provided] Overview: About smartphone apps designed to easily plan personal or family budget and track where our money "disappears."

Task 3. (Duration: 45 minutes): Create a sustainable household budget plan for a month (or another period), real or imagined, taking into account personal needs and environmental aspects. Follow the rules of personal budget planning. Include income, expenses, savings, and long-term sustainability goals in your plan. You can create the budget using a chosen app or by writing it down on paper (Annex No. 1).

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	Step 1. Define your sustainability goals and values. This might relate to using eco-friendly products, reducing food waste, decreasing energy consumption, etc. Step 2. Conduct a sustainability review: Review your current expenses and evaluate where you can implement sustainability principles. This could involve choices in food products, energy use efficiency, recycling habits, etc. Step 3. Set priorities: Identify the areas where you most want to become sustainable and set your priorities. For example, if your priority is food sustainability, you might focus your efforts on buying organic products or growing your own garden. Step 4. Create a budget plan: Based on your identified sustainability goals and priorities, create a budget plan that encourages sustainable products and actions. Define categories for which you want to allocate funds, such as "organic food," "sustainable transport," "energy efficiency improvements," etc. Purchasing eco-friendly products: During budget creation, you can set different categories for allocating funds to eco-friendly products. This could be organic food, eco-friendly cleaning products, recycled or reusable items. This might also include sustainably produced clothing, eco-friendly beauty products, etc. Energy efficiency measures: In your budget plan, you can include expenses for energy conservation and efficient use of energy. This could cover investments in energy-saving measures at home or in eco-friendly energy production technologies, such as solar panels or wind turbines. Transportation alternatives: You could plan expenses for sustainable transportation, such as public transport, bicycles, or electric vehicles. You can also include expenses related to pedestrian paths, which also promote sustainable mobility. Step 5. Draw conclusions: Indicate whether a sustainable budget can have long-term positive consequences at both a personal and community level. Step 6. Present your created budget.
Assessments	The final result is assessed with a grade. (Assessment Table No. 1) The ability to create a sustainable budget according to the provided criteria. The comprehensiveness of the budget, the inclusion of sustainability principles in the budget. The ability to draw conclusions and participate in the budget presentation.
Key Competences	Communication competence Digital competence Cultural competence Social, emotional and healthy living competences Creativity competence Citizenship competence
Connections with Eco STEAM	**Eco –** The use of resources sustainably and consideration of environmental sustainability. Science – Incorporating science into budget planning can encourage innovations that address environmental challenges and develop new eco-friendly technologies. Technology – The use of computers for information search, budget preparation, and presentation. Engineering – Including devices in the sustainable budget plan that help preserve nature and contribute to the development of renewable energy sources. Art – Aesthetically designed budget.

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	Math – Calculations made while creating the budget plan.
References	• Aiming for sustainability in everyday life https://blog.swedbank.lt/tvariu-namu-gidas#siekiu- tvarumo-kasdienybeje • Renovating homes https://blog.swedbank.lt/tvariu-namu-gidas#atnaujinu-namus • Family Budget or Everyone Can (Video lesson that will help delve deeper into the rules of budgeting) https://blog.swedbank.lt/video-pamokos/giluciu-seima-seimos-biudzetas-arba-kiekvienas-gali • Financial planning apps. https://finanpa.com/asmeniniu-finansu-planavimo-programeles/ • Textbook "Economics in 31 Hours" https://www.ekonomikosvadovelis.lt/turinys/asmeniniai-finansai/asmeninis-biudzetas/
Notes	• The activity may span 2 sessions. • When planning the budget online, find information about the costs of various sustainable products (e.g., energy-saving light bulbs, etc.).

Annex No. 1.

Example of a Sustainable Budget Plan						
Sustainability Goal(s):						
Sustainability Review (where I can implement sustainability principles):						
Sustainability Priorities:						
Budget Plan						
Income (Eur.)	**Expenses (Eur.)**		**Savings (Eur.)**		**Long-term sustainability goals (Eur.)**	
salary	financial obligations		autonomous saving		energy-saving devices	
investments	food		……..		water flow regulators	
interest	housing costs				eco-friendly showerheads	
rental income	transportation				recycled items	

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state benefits		health care				reusable products	
other types of income		entertainment				……..	
…….		…….					
Findings:							

Assessment Table No. 1

Assessment Criteria	Points	Comments
Formulated sustainability goal(s)	_/1	
Sustainability review	_/1	
Sustainability priorities	_/1	
Budget plan	_/5	
Conclusions	_/1	
Budget presentation	_/1	
Overall assessment	_/10	

1.4.4. ACTIVITY PLAN: DESIGN PLASTIC FOR THE FUTURE - BIOPLASTIC BAG	
Introduction part (or activity overview)	Students will demonstrate experimental work, implementing the Environmental Awareness and Conservation teaching model in chemistry learning. Students analyze problems related to polymer topics and use their knowledge to develop biodegradable plastics that are environmentally degradable.
Setting	A chemical cabinet with appropriate equipment for conducting physical - chemical processes or a classroom with the necessary equipment and materials. Educational context: teamwork and learning.
Materials Needed	Gelatin, glycerol, beaker, chopsticks, mixing bowl, measuring equipment, scale,

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	thermometer, glue, scissors, food coloring, computer or telephone.
Learning Outcomes	• Raising students' environmental awareness, obtaining a final product that does not pollute the environment • Develop skills for experimental work • Collaborate and develop skills for teamwork • Learn to prepare materials needed and design biodegradable plastic • Draw conclusions based on experimental results • Create thinking about sustainable living and green technologies
Activity Contents	**Activity 1: Preparation of laboratory equipment and necessary chemicals** **Theoretical part (Duration: 15 minutes):** Discussion on the pollution of nature with toxic waste from traditional plastics, greenhouse gas emissions, dependence on fossil fuels and the amount of waste in landfills. https://www.youtube.com/watch?v=qiXRTA0tYoI Approx. 2 min 35sec https://www.youtube.com/watch?v=_6xlNyWPpB8 Approx. 4min 06sec Discussion around creative ideas for recycling of traditional plastics, producing high-quality secondary polymer raw materials that are then converted into new plastic products. https://www.youtube.com/watch?v=zO3jFKiqmHo Approx. 3min 50sec **Task 1 (Duration: 10 minutes):** Searching for ecological alternatives for synthesizing biodegradable plastic "Green Plastic", which is mostly produced from plant-based polymers, unlike traditional plastics, which are made from non-renewable petroleum products https://www.youtube.com/watch?v=6ky9opWGc-c Approx.4min 38sec **Task 2 (Duration: 20 minutes):** Students research online about composition and properties of biobased polymer, review necessary equipment, videos that provide an explanation of the process during experimentation. **Videos:** https://www.youtube.com/watch?v=SNaLBaAiAGU Overview: Video shows biodegradable plastic Duration: Approx. 4min 25sec https://www.youtube.com/watch?v=fDStwxetx7Q Overview: The video will help to demonstrate the process of making bioplastic sheets and design a bioplastic bag Duration: Approx. 7min 23sec **Task 3 (Duration: 1 hour):** Students are divided into groups and distribute their work

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	responsibilities, set up the laboratory equipment and reagents needed for the experimental process. **Activity 2: Demonstration an experimental work** **Theoretical part (Duration: 10 min) :** An introductory discussion about the way to demonstrate the experiment. **Task 1 (Duration: several days):** Making bioplastic Step 1 (25 min): Measure ingredients Make a solution of 6.75 grams of gelatin with 4 ml of glycerol in 1000 ml of water (to make a solution, we will mix water and glycerol together). Whisk the solution. These are the basic components of our bioplastics. Step 2 (1 h 15 min): Combining the ingredients Measure out 360 ml of solution, heat to 90 degrees Celsius or 194 degrees Fahrenheit. Gradually add gelatin to the solution as it heats. At first, we see that the gelatin does not dissolve in the water. After heating the gelatin, the hydrogen bonds break and allow a reaction with water. Step 3 (3 days): Pouring and drying Use food coloring such as beet juice, henna, saffron, spirulina to change the color of your plastic. You can put spirulina (biomass of cyanobacteria-green algae) in the glass and naturally change the color to green. Pour the coloring plastic into a baking pan, mix it with the cutlets. Before you let your plastic dry, add spinach seeds. After the mixture has cooled, let the plastic dry until it is completely dry, and the edges start to peel (3 days later). To create a complete bag, you need to make two more plastic sheets. Step 4: (10 min): Comparing the strength of the final product, obtained by chemical means, compared to the natural one. **Task 2 (Duration: 30 minutes):** Final Work. Reflection. Students present experimentally obtained results and conclusions, prepare a description for designing biodegradable plastic, as a suitable way to preserve the environment.
Assessments	The final product will be evaluated through the self-evaluation method. The evaluation segments are contained in the evaluation table, which includes: Proper handling of laboratory equipment and reagents, the quality of the resulting product - bioplastic bag, skills in presenting about sustainable living and green technologies, description. All students in the class can be included in the evaluation.
Key Competences	• Cognitive competence • Creativity competence • Communication competence • Social, emotional and healthy living competences • Citizenship competence • Digital competence • Cultural competence

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Connections with Eco STEAM	**Eco** – design bioplastic that can be decomposed in nature through biological processes. **S**cience -experimental research with practical objectives. **T**echnology - production of biodegradable bags. **E**ngineering - developing a model to reduce environmental pollution and applicable in production. **A**rt- drawing charts to show the strength and flexibility of the final product, obtained by chemical means, compared to the natural one. **M**ath - mathematical calculations for making solutions of glycerol with water.
References	https://www.youtube.com/watch?v=qiXRTA0tYoI https://www.youtube.com/watch?v=_6xlNyWPpB8 https://www.youtube.com/watch?v=zO3jFKiqmHo https://www.youtube.com/watch?v=6ky9opWGc-c https://www.youtube.com/watch?v=SNaLBaAiAGU https://www.youtube.com/watch?v=fDStwxetx7Q
Notes	 The final product - Bioplastic The following activities 4.5 will be the students' homework. They will have to make several sheets, assemble them and design a biodegradable bag.

Evaluation Table

Evaluation Criteria	Points	Comments
Proper handling of laboratory equipment and reagents	_/5	
The quality of the resulting product - bioplastic bag	_/5	
Skills in presenting sustainable living and green technologies	_/5	
Team works and collaboration	_/5	
Description		

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1.4.5. ACTIVITY PLAN: DYEING WITH NATURAL DYES	
Introduction part (or activity overview)	This session is designed to explore the use of natural materials for dyeing fabric or other materials (optional boiled eggs). Creating art with natural dyes can be a rewarding and environmentally friendly activity. The activities are structured to provide a rich blend of theoretical knowledge and practical fieldwork; students engage in a hands-on exploration of natural dyeing, fostering creativity, environmental consciousness, and appreciation for traditional art practices.
Setting	Classroom complemented by digital research.
Materials Needed	Various natural dye materials (e.g., onion skins, turmeric, spinach, beets, berries, coffee grounds, avocado pits, red cabbage, flower from hibiscus, walnut leaves etc.) - Fabric or clothing items to dye (cotton, linen, silk, wool or optional boiled eggs); large pots or containers for dyeing; water, also vinegar or other compounds (optional, for fixing dye); stainless steel or enamel pots (intended for dyeing), stirring utensils; strainers or cheesecloth; rubber gloves (optional); aprons or old clothing to protect against stains; access to a stove or heat source; plastic wrap or bags for wrapping dyed items (optional); labels or tags for identifying dye materials and colors.
Learning Outcomes	• Understanding the concept of dyeing materials with natural colors as well as its historical significance and role in environmental preservation, increasing creativity among students to find as many natural colors as possible and ways of coloring with them; • Enhancing skills in digital research and data analysis; • Improving ability to critically analyze and discuss the significance of the use of natural colors to preserve the environment;
Activity Contents	**Activity1 Steps – (**Duration: 1-2 hours for dyeing process, additional time for preparation and cleanup) **Activity (The process of dyeing with natural dyes)** **Theoretical part 1: (15 minutes)** The teacher introduces to students the concept of natural dyeing and its historical significance, as well as a variety of natural dye materials. Then they discuss the environmental benefits of using natural dyes compared to synthetic dyes, emphasizing sustainability and eco-friendliness. Students watch this video https://www.youtube.com/watch?v=Gwk1B66dvAM Duration: (5min 28 sec) Overview: In the video are given different examples of dyeing with natural dyes **Task 1: (30 minutes)** Students choose the materials they are most interested in experimenting with. Class is

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	divided into small groups or pairs, assigning each group a different natural dye material. The teacher gives a task to the students to prepare their dye baths by adding the chosen dye materials to pots of water and bringing them to a simmer. Optionally, they add vinegar or other compounds to the dye baths to help fix the colors. **Task 2: (45-60 minutes)** The teacher gives instructions about the dyeing process, rinsing and finishing. Students use fabric or clothing items or boiled eggs to dye - they wet the fabric beforehand to help the dye penetrate evenly, then submerge the fabric or egg in the dye bath, ensuring that it is fully immersed. Students let the fabric or egg simmer in the dye bath for an extended period, periodically stirring to ensure even dye distribution. (varying lengths of time, depending on the desired intensity of color) When dyeing is finished, students rinse the fabric/egg thoroughly under cold water to remove excess dye (optionally, wash the dyed fabric with mild detergent to remove any remaining dye particles.) Students place the fabric to air dry, avoiding direct sunlight to prevent color fading. **Task3: Evaluation and reflection, cleanup (20 minutes)** The teacher gives a task to students to evaluate their working process and to clean up the workspace. Once the dyed fabric has dried, students evaluate their results and reflect on the dyeing experience - the colors obtained, the effectiveness of different dye materials, and any challenges encountered during the process. Students clean up their workspaces, rinsing pots and utensils and properly disposing of any leftover dye materials. **Additional Tips:** The teacher empowers students to research color theory and mix to create harmonious color combinations. Students may consider incorporating natural dyeing into other art projects such as tie-dyeing, batik, or fabric painting for added versatility. The teacher emphasizes safety precautions when working with heat and dye materials and encourages students to wear protective clothing and gloves if necessary. The teacher could showcase the finished dyeing items in a display or exhibition to celebrate students' creativity and promote awareness of natural dyeing techniques.
Assessments	• Assessment of Web Quest reports for depth of research and understanding. • Evaluation of the thoroughness and accuracy of practical observation records. • Group presentations synthesizing practical inventions, with a focus on which color is the most intense, which color is the most beautiful, etc.
Key Competences	• Cognitive competence • Cultural competence • Creativity competence
Connections with Eco STEAM	Eco- environmental awareness, and appreciation for traditional art practices Science - ecological science (studying chemistry of natural colors)

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	Technology- use of digital tools for research Engineering –coloring different materials with ancient methods Arts - developing creativity through the use of natural materials for coloring Math- data analysisabout the degree of coloring using different materials
References	• Academic and scientific literature on about dyeing with natural colors, how different materials are dyed, does the temperature affect the dyeing, does the standing time affect the intensity of the color. • Online databases and resources for dyeing materials with natural colors research.
Notes	• The practicalworkshop should be adaptable to different local natural dyeing materials. • Emphasize safety and ethical conduct during practical work and observation. • Encourage students to reflect on their role in environment conservation and the importance of sustainable practices.

Assessment Table for Web Quest Reports:

Assessment Criteria	Points	Comments
Depth of Research	_/5	
Understanding of natural colors	_/5	
Accuracy of Information	_/5	
Quality of Presentation	_/5	
Use of Visuals	_/5	

Assessment Table for Group Presentations:

Assessment Criteria	Points	Comments
Comprehensiveness of Findings	_/5	
Clarity in Presentation of Data	_/5	
Understanding of natural dyeing concepts	_/5	
Ecological Interpretations and Insights	_/5	
Teamwork and Collaboration	_/5	
Use of Visual Aids in Presentation	_/5	

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1.4.6. ACTIVITY PLAN:THE ROLE OF MICROPLASTICS IN COSMETICS: CHALLENGES AND POSSIBLE SOLUTIONS	
Introduction part (or activity overview)	In exploring the topic of microplastics' role in cosmetics, students will learn about the environmental and human health issues associated with microplastics and possible solutions that could be implemented to reduce the use of microplastics in the cosmetics industry. Students will gain practical skills in making natural body scrubs while adhering to hygiene standards.
Setting	A classroom equipped with multimedia projectors, mobile phones, computers for groups of students to perform the theoretical part. A chemistry lab where necessary educational materials are available.
Materials Needed	Various materials for making body scrub (see activity content or use information found in digital space). Tools: scales, measuring cylinder, pestle and mortar, electric grinder, reusable containers for the finished product (e.g., used cosmetic containers), tools for creating labels, dyes, colouring tools (coloured pencils, gouache, markers, acrylic paints, and other decoration tools).
Learning Outcomes	• Understand the prevalence of microplastics and their impact on cosmetics products. • Acquire knowledge about the effects of microplastics on water systems, ecosystems, and human health. • Gain the ability to analyze and assess the situation regarding the reduction of microplastics in cosmetics based on scientific research, statistics, and legal analysis. • Identify and evaluate possible solutions that could be implemented to reduce the use of microplastics in cosmetics. • Improve skills in creating unique body scrubs with different components and textures. • Enhance digital skills in searching for information in various sources and applying them to product manufacturing.
Activity Contents	**Activity 1: Introduction about microplastics, their prevalence, impact on human health, and ecosystems.** **Theoretical Part (Duration: 90 minutes):** Discussion about microplastics and their use in cosmetic products, including creams, shampoos, toothpaste, laundry detergents, and many other products. They were added to these products as softening, shining, or abrasive elements. Microplastics were favored for their cheapness, flexibility, and long shelf life. However, many countries have taken action to limit or ban the use of microplastics in cosmetic products due to environmental pollution. For example, the European Union adopted a law prohibiting the use of microplastics in cosmetic products from January 1, 2020. However, some microplastics can still be used in cosmetic products, such as polyethylene, polypropylene, polystyrene, etc. This may be why it is important to carefully read product labels and avoid products containing such ingredients. Many cosmetics companies have also started to create alternative products where microplastics are replaced with natural or biodegradable ingredients. For instance, instead of microplastic abrasives, natural particles such as sugar, salt, ground coffee, or olive pits, etc., can be used. **Task 1: Discussion**

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Students are divided into groups and, after reviewing links:

https://www.youtube.com/watch?v=Q1EWocb7oR0 Duration: Approx. 3 minutes
https://www.youtube.com/watch?v=QGDKmA-ZU3w Duration: Approx. 7 minutes
https://www.youtube.com/watch?v=B4pzGayFV4w Duration: Approx. 14 minutes

or using digital sources, discuss the following topics:

1. **Environmental Impact:**
   - How can microplastics from cosmetic products enter water systems and soil?
   - What impact do they have on aquatic animals and ecosystems?
   - Are there alternative materials that can be used in cosmetics without negative consequences for the environment?
2. **Health Risks:**
   - Can microplastics in cosmetics pose a danger to human health?
   - How can they enter the human body through the skin or other means?
   - What kind of research is needed to assess this risk?
3. **Actions of the Cosmetics Industry:**
   - How does the cosmetics industry respond to concerns about microplastics and what measures does it take?
   - Do companies take responsibility and strive to transition to more environmentally friendly ingredients?
4. **Legal Measures and Regulation:**
   - What are the legal regulations regarding the use of microplastics in cosmetics in different countries or regions?
   - Are stricter legal measures needed to protect the environment and consumers?
5. **Consumer Information and Awareness:**
   - How can consumers be informed about products containing microplastics?
   - How to encourage conscious consumption and choices that are friendly to the environment?
6. **Alternative Materials and Innovations:**
   - What alternative materials can be used in cosmetics as substitutes for microplastics?
   - How can innovations encourage the development of more environmentally friendly cosmetic formulas?

Each group prepares a presentation using Microsoft PowerPoint, Padlet, Canva, Movie Maker (for creating movies), or another presentation program.

Task 2: Students bring 2-3 cosmetic product packages to the class. They analyze, discuss, draw conclusions, and present to their classmates on the following aspects:

1. **Ingredients:** Look at the list of ingredients. It's important to pay attention to the first ingredients listed, as they make up the majority of the product.
2. **Preservatives:** Note the presence of chemical substances such as parabens or sulfates.

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3. **Product Purpose:** Most cosmetics labels indicate the intended use of the product (for example, for dry skin, oily skin, shampoos for specific hair types).
4. **Usage Instructions.**
5. **Expiration Date.**
6. **Special Labels:** Cruelty-Free and Vegan.

Activity 2 (Duration: 90 minutes): Natural Body Scrub Making.

Theoretical Part: Natural body scrubs help remove dirt, dead skin cells, moisturize, and nourish the skin. Therefore, they can be made by oneself.

Task: Students are divided into pairs, make body scrubs, with recipes from the internet or try to create their own recipe from the materials brought. They create a label for the product, packaging considering the following requirements:

1. The label must indicate the name, list of ingredients in descending order, package weight, expiry date, storage, and usage instructions.
2. Packaging material should be recyclable or made from renewable resources.
3. Choose packaging that is sustainable and made using fewer resources, such as cotton, bamboo, glass, or other natural and sustainable materials.
4. Opt for smaller packaging, as it means less waste and a smaller environmental impact.
5. Add labels on the package informing consumers how to properly recycle or dispose of the package.
6. Calculate the cost of the product.
7. Present and advertise the manufactured product.
8. Discuss their successes and failures in making the body scrub.

1. **Sea Salt Scrub:**
    - 1 tablespoon of sea salt (or another fine salt)
    - 0.5 tablespoon of olive oil
    - 0.5 tablespoon of honey
    - A pinch of ground cinnamon and cardamom
    - 1 tablespoon of lemon juice (or 3 drops of grapefruit essential oil)

How to make: Mix everything together. Store the prepared scrub in an airtight and clean jar in a cool place. The salt can be replaced with brown sugar (it should be ground in a coffee grinder to make the exfoliating effect softer), and the olive oil can be substituted with coconut oil.

2. **Coconut and Lime Scrub:**
    - 100g of white sugar
    - 25g of melted coconut oil
    - 1 teaspoon of coconut flakes
    - 3-4 drops of lime essential oil

How to make: Mix the melted coconut oil with sugar until it becomes a uniform mass. Add the coconut flakes and lime essential oil to the mixture and mix well. Store the prepared scrub in an airtight and clean jar in a cool place.

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3. **Lavender Scent Scrub:**
    - 0.5 cup of Dead Sea salt,
    - 1 tablespoon of baking soda,
    - 0.5 tablespoon of lavender flowers,
    - 0.5 teaspoon of apricot kernel oil,
    - 3-4 drops of lavender essential oil.

How to make: Mix the salt with baking soda, lavender flowers, apricot kernel oil, and lavender essential oil. Place the mixture in a tightly sealed container. Shake the contents of the container before use.

4. **Chocolate Scrub:**
    - ½ cup of white sugar,
    - ½ cup of brown sugar,
    - ½ cup of coconut oil,
    - ¼ cup of cocoa.

How to make: Mix the white and brown sugar, pour in the coconut oil, and add the cocoa. Mix everything well. Place the mixture in a tightly sealed container. Store the prepared scrub in an airtight and clean jar in a cool place.

5. **Honey Scrub:**
    - 3 teaspoons of honey,
    - ¼ cup of olive oil,
    - 1 cup of oatmeal,
    - 2 teaspoons of lemon zest.

How to make: Mix the honey with olive oil. Pour the mixture into the oatmeal, add lemon zest, and mix again. Place the mixture in a tightly sealed container. Store the prepared scrub in an airtight and clean
jar in a cool place.

6. **Almond Scrub:**
    - 3 teaspoons of honey,
    - 3 teaspoons of olive oil,
    - 1 cup of sea salt,
    - 11 almonds,
    - ¼ cup of lemon juice.

How to make: Grind the almonds in an electric grinder. Then mix them with olive oil, sea salt, honey, and lemon juice. Place the mixture in a tightly sealed container. Store the prepared scrub in an airtight and clean jar in a cool place.

Scrub recipies links:

https://manogyvenimas.lt/odos-sveitikliu-receptai-kuriuos-galite-pasidaryti-namuose/

https://www.15min.lt/gyvenimas/naujiena/mada-ir-grozis/pasigaminkime-pacios-kuno-sveitikliai-1062- 281483

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Assessments	Each student self-assesses their work according to the provided annex No. 1. Each group presents their work results, evaluates successes and failures, their contribution to the group work, performs a verbal reflection, and is graded. The assessment includes all class students.
Key Competences	Cognitive competence Creativity competence Communication competence Social, emotional and healthy living competences Citizenship competence Digital competence Cultural competence
Connections with Eco STEAM	Eco - choice of environmentally friendly materials and their property research. Science - knowledge in biology, chemistry, economics, and environmental sciences. Technology - technological solutions in making/creating body scrub. Engineering – making body scrub from ecological materials/resources. Art - creative solutions that convey the impact of microplastics on the environment, life, and promote sustainable thinking and aesthetics. Math - students can analyze and interpret data about the use of microplastics in cosmetics, their prevalence in the environment, and their possible impact on health and ecosystems.
References	https://www.15min.lt/gyvenimas/naujiena/mada-ir-grozis/pasigaminkime-pacios-kuno-sveitikliai-1062-281483?utm_medium=copied

RESEARCH GUIDE FOR ACTIVITY 1

Annex 1. Assessment Table

Skills in addressing theoretical and practical questions:	I know very well	I know well	I know satisfactorily	What I didn't understand/didn't know and what else I need to learn
1. Formulate the purpose and tasks of the practical work.				
2. Develop a work plan.				
3. Independently make a body scrub.				
4. Create a label for the product, considering the requirements.				
5. Create packaging for the product, considering the requirements.				
6. Calculate the cost of the product.				

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7. Formulate conclusions and present the work.				

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