Unapredjenje znanja i veština
povezanih sa ciljevima održivog razvoja
orjentisanih na temu vode
u kurikulumu za osnovne škole

Erasmus+
Обогаћује животе, шири видике.

SUSTAINSTUDY

Improving knowledge and skills by connecting the sustainable development goals oriented

towards the topic of water with the curriculum for primary schools

e - Handbook

Education is the path to personal transformation that helps improve society, address global issues, and create a better world for everyone. This is why one of the Sustainable Development Goals (SDGs) has been established: SDG 4: Quality Education, and it is important to follow it. Teachers have the power to help students develop knowledge, skills, values, and behaviors in response to global challenges, building a more just, peaceful, and sustainable world. However, a global survey of 58,000 teachers conducted by UNESCO and Education International and published in the report 'Teachers Have Their Say' shows that although many teachers are motivated, a quarter still do not feel ready to teach topics related to Education for Sustainable Development. It is encouraging that more than 90% of respondents believe that issues related to Education for Sustainable Development are important, and more than 80% want to expand their knowledge about them.

This e-Handbook is the result of the project SustainStudy: 'Improving knowledge and skills related to Sustainable Development Goals focused on the topic of water in the curriculum for primary schools' conducted by experts from partner organizations of the Erasmus+ program from Serbia, Croatia, and Slovenia. The e- Handbook is intended for primary school teachers and students aged 6-14. It is designed to encompass three thematic units: water, food, and environmental conservation, which interweave. The topics can be addressed individually or as separate areas depending on objective circumstances. The guiding principle for the authors of the manual was an understanding of the circumstances in which the teaching process takes place, and therefore different teaching models are offered.

The e-Handbook also contains a methodological guide for primary school teachers based on interactive, experiential pedagogy aligned with sustainable development goals. It includes worksheets with supplements that suggest practical activities for integrating these topics into existing school curricula in all three countries. Finally, we provide teachers with a broader perspective through recommended literature and links to working materials. The e- Handbook focuses on three aspects: General recommendations for education on environmental conservation oriented towards SDGs; Recommendations for classroom teaching; and Recommendations for outdoor and informal education. As authors and experts in these modules, we aim to positively influence the methodological

competencies and skills of teachers that need to be developed in accordance with Eurostat's recommendation for the necessary 'increase in the supply of qualified teachers' to ensure better conditions for the transmission of knowledge about environmental conservation and resources.

The activities and worksheets in the e-Handbook facilitate teachers in guiding students towards independent discovery, drawing conclusions, and solving problem-based and project tasks. Students can solve tasks independently or through group work, where each student will be able to achieve corresponding success. It is also important to note that students are further motivated through peer education and collaboration with certain institutions. The writing process considered that activities should not only take place in the classroom but also outside it, in so-called extracurricular activities. Besides helping teachers integrate SDGs into their teaching plans and students develop key competencies for action, we believe that the guidelines and tools for implementing sustainability-oriented activities will aid school policies and encourage schools to strengthen their connections with the community and discover how parents, organizations, and companies can help them achieve necessary sustainability in their environments. The authors aimed to offer innovative ideas and methods to teachers on how to connect the topics covered in the regular teaching process with the Sustainable Development Goals. We believe we have succeeded in this endeavor.

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INTRODUCTION

In today's world of limited resources, increasing pollution, significant social divisions, and a rapidly growing population, humanity faces numerous powerful pressures that must be addressed to preserve the life we know. To tackle some of the greatest global challenges, the United Nations has set 17 Sustainable Development Goals (SDGs) as priorities to be achieved by 2030, with consensus reached among most countries worldwide. The strategic approach to achieving global sustainable development has been further supported by the European Commission, which intends to achieve a sustainable future for Europe by fulfilling the planned ten political priorities among member countries.

Strategies and policies promoting sustainability are accompanied by education through the concept of Education for Sustainable Development (ESD), as it is clear that the current extreme climate situation and other ecological sustainability crises are products of human behavior that needs to change. Education for Sustainable Development emerged from the need to address growing sustainability challenges and employs innovative, action-oriented pedagogy to enable students to develop awareness, acquire knowledge about issues, and take measures for transforming into a more sustainable society.

A major study by UNESCO and Education International on motivation, skills, and opportunities for Education for Sustainable Development, conducted with 58,000 teachers, reveals that teachers feel least confident in educating about sustainable consumption and production—crucial for the necessary behavioral transformation to live within our ecological limits. Therefore, the manual emphasizes global challenges related to resource use, particularly water, and their interdependence with food systems, which need to become more sustainable and resilient. This also includes addressing the issue of food waste. Although the mentioned topics are included in the Sustainable Development curriculum, planned as an interdisciplinary topic in primary and secondary schools in Croatia, there are currently no available materials for teachers and professors. Therefore, through the Erasmus+ project 'Improving Knowledge and Skills Related to Sustainable Development Goals Focused on the Topic of Water in the Curriculum for Primary Schools,' experts from partner organizations in Serbia, Croatia, and Slovenia have developed the teaching materials contained in this manual. All materials have been tested in all three countries, in partner schools and schools associated with the project, confirming their relevance in everyday teaching practice.

The Education Development Strategy up to 2020 indicates that the education system of the Republic of Serbia has the task to 'educate the population of the Republic of Serbia in accordance with expressed or recognized developmental orientations towards sustainability and to respond to the educational needs of every citizen of the Republic of Serbia throughout their entire life.' However, the contemporary primary school curriculum in Serbia does not include a specific subject dedicated to sustainable development. Nevertheless, an analysis of the curricula for subject-based and classroom teaching shows that students encounter some concepts related to sustainable development in primary school. These include: The World Around Us, Nature and Society, Civic Education, Geography, Biology, Technology and Engineering, Physics, and Chemistry. However, beyond these encounters, there is no dedicated manual for teachers, and there is especially no textbook for students. (Vukić T., Jovanović M. Didactic Aspects of Implementing Education for Sustainable Development in Modern School Curricula, 2020.)

!! We believe that the manual will contribute to acquiring knowledge and developing skills related to sustainability for both teachers and students.

In 2007, Slovenia adopted Guidelines for Education and Training for Sustainable Development from preschool to pre-university education. In 2016, the National Education Institute of Slovenia analyzed how the field of sustainable development is included in various curricula and programs. They concluded that sustainable development is not yet taught as a comprehensive concept where ecological, economic, and social issues are interconnected. The ecological aspect is better represented, while the socio-economic and cultural aspects are less covered. Ecological actions are more planned than long-term changes in students' mindsets (Kregar, S. Sustainable Development and Ecological Content in the Analysis of School Programs – EOL 172 – Green Slovenia). In Slovenia, ecological themes are comprehensively addressed through an interdisciplinary curriculum called Environmental Education as Education and Training for Sustainable Development, which, however, falls under elective subjects and is therefore not equally accessible to all students. Currently, there is no material addressing the Sustainable Development Goals from the perspectives of food, water, and the environment.

We believe that the manual will contribute to acquiring knowledge and developing skills related to sustainability for both teachers and students. It will also assist them in tracking and analyzing the effects of climate change, resource efficiency, and complex issues related to water use, food production, and waste. Sustainable Development Goals (SDG):

1. No Poverty
2. Zero Hunger
3. Good Health and Well-being
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation, and Infrastructure
10. Reduced Inequalities
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life on Land
16. Peace, Justice, and Strong Institutions
17. Partnerships for the Goals

The latest report on progress towards the SDGs, published in mid-2023, highlights that progress on more than 50% of the goals is weak and insufficient, and for at least 30% of the goals, progress has stalled or reversed (including goals related to poverty, hunger, and climate). The COVID-19 pandemic and the triple ecological crisis—advancing climate change, biodiversity loss, and pollution—have had devastating and lasting impacts on achieving the goals. Ongoing conflict zones, particularly those in our immediate surroundings, have further exacerbated the crisis, especially with food and energy. This impact must also be linked to the Sustainable Development Goals. The numbers are expected to rise due to the recent war between Israel and Hamas, with the full consequences yet to be revealed in the coming period.

Developing countries continue to bear the greatest burden of the collective failure to invest in sustainable development goals, as they are weighed down by debts due to insufficient financial resources. On the other hand, developed countries adopted expansive fiscal and monetary policies during the pandemic and have largely returned to growth paths seen before the emergence of the coronavirus.

Financing for climate change mitigation also falls far short of the agreed target, with developed countries failing to deliver the promised $100 billion annually since 2020. Meanwhile, vulnerable middle-income countries are deprived of debt relief, and the G20 Common Framework for Debt Treatments simply does not work, according to the current United Nations report on progress towards achieving the SDGs.

The Sustainable Development Goals are envisioned as a universally agreed-upon roadmap to bridge economic and geopolitical divides, restore trust, and rebuild solidarity. This failure means that inequalities will continue to deepen, and the world will remain divided, despite the fact that no country can afford the failure of the 2030 Agenda. The UN report sounds the alarm, emphasizing the urgent need for a rescue plan for people and the planet.

A deep reform of the outdated, dysfunctional, and unfair international financial architecture is essential. This needs to be replaced with financial institutions that ensure the benefits of globalization are accessible to all and that provide a safety net for all countries in difficult times. Although it seems that the worst of the COVID-19 pandemic is over, the world is still recovering from its consequences at a slow and uneven pace. The pandemic has caused significant disruptions in global health outcomes. Child vaccination rates experienced the largest decline in thirty years, and mortality rates from tuberculosis and malaria have increased compared to the pre-pandemic period. COVID-19 has also had a devastating effect on education, with equally severe economic consequences. The pandemic halted thirty years of steady progress in reducing poverty, leading to an increase in the number of people living in extreme poverty for the first time in a generation. It has also caused the greatest rise in inequality among countries during this period. The climate crisis is worsening as greenhouse gas emissions continue to rise. The latest report from the Intergovernmental Panel on Climate Change (IPCC) reveals that global temperatures are 1.1°C above pre-industrial levels and are likely to reach or exceed the critical threshold of 1.5°C by 2035. Catastrophic and increasingly severe heat extremes, droughts, floods, and wildfires have become more frequent around the world. Rising sea levels threaten hundreds of millions of people in coastal areas.

Additionally, the world is currently experiencing the largest species extinction event since the age of dinosaurs, and oceans were burdened with over 17 million cubic meters of plastic waste in 2021, with projections indicating that this could potentially double or triple by 2040. The situation in Europe is similar to the global one. Drought causes approximately 9 billion euros in annual losses, mostly in

agriculture, the energy sector, and public water supply. Extreme droughts are becoming more frequent in Europe, leading to increasing damages. With the rise in global temperatures, the Atlantic and Mediterranean regions would bear the greatest consequences, especially due to wildfires. Climate change increases the share of areas at risk of wildfires, so even those previously not at risk are now in danger. River floods are a common natural disaster in Europe, which in recent decades, along with storms, have caused fatalities, affected millions of people, and caused enormous economic damage. In the coming years, climate change will continue to increase the likelihood of floods. In 2022 and 2023, Slovenia experienced the largest recorded natural disasters so far: first wildfires and then floods. Powerful storms will become more intense and frequent due to rising temperatures, and flash floods will become more common across Europe. (European Commission, Impacts of Climate Change)

In the context of such a global picture and considering the global imperatives set by the Sustainable Development Goals 2030, world leaders have decided to focus on food and the prevention of food waste, as well as the conservation of natural resources. Hence, the International Day of Awareness of Food Loss and Waste is observed on September 29. The goal is to raise awareness about the necessity of conserving resources for food production and to reduce global food waste by 2030. Ambitious plans to reduce food waste volumes require coordinated efforts throughout the entire food supply chain. The attitude and behavior of the end consumer are also crucial factors in combating food waste. In this regard, marking the International Day of Awareness of Food Loss and Waste can significantly contribute to raising awareness about the importance of the issue and its potential solutions at all levels, and promote global efforts and collective actions aimed at reducing food waste. Reduced consumption, better nutrition, and adopting sustainable lifestyles are key to achieving a world without hunger. Although the progress report on achieving the SDGs presents a stark picture of the current state, it nonetheless offers a vision of hope by showcasing the progress the world has made so far and the potential for further positive change. It is now up to all of us to ensure that these goals are fully and timely achieved. This generation is equipped with unprecedented knowledge, technology, and resources in history. A breakthrough towards a better future for all requires us to leverage these advantages to lift hundreds of millions out of poverty, improve gender equality, reduce emissions by 2030, and secure human rights for everyone.

LINK https://sdgs.un.org/goals

TOPIC 1

FOOD

As future consumers whose decisions will shape markets, students are an essential link on the path to sustainable food systems. Therefore, it is equally important to educate them about sustainable food production and avoiding food waste. The aim of education is to increase knowledge, awareness, and engagement with sustainable consumption and production patterns to mitigate and adapt to climate change by enhancing the competencies of young people as catalysts for change in their communities, promoting ecological and inclusive changes in food consumption behaviors. In this way, young people will gain knowledge about understanding global and local issues related to sustainable food chains and climate change, increase their knowledge about the food system, policies, and practices related to climate change adaptation and mitigation, and improve and advance their skills to be drivers of change in local communities.

FOOD AND CLIMATE CHANGES

Food production is a major driver of global environmental changes, as it uses 25% of the Earth's habitable land, consumes about 70% of global freshwater for drinking, and is the primary cause of land conversion. Despite the exceptionally high environmental pressure exerted by agriculture, one-third of global food supplies are wasted or discarded each year. This alarming statistic reveals not only a significant loss of agricultural land, water, energy, time, human labor, and money, but also an additional severe environmental burden, as most of the wasted food ends up in landfills, contaminating soil, water, and air.

Global food waste accounts for 8 to 10% of greenhouse gas emissions, occupies an area larger than China, uses as much water annually as all households worldwide, and results in an economic loss of $1 trillion. However, the true costs of land, water, and biodiversity loss caused by the combination of food production and waste, as well as the consequences of negative climate change impacts, have yet to be fully determined. In addition to being an environmental and economic issue, food waste is also a moral problem. While some people waste food, others suffer from hunger. The number of socially vulnerable, malnourished, and hungry individuals is expected to increase further, exacerbated by global inflation, the effects of climate change, and current conflicts, especially with the ongoing rise in population and the negative impacts of climate change. The latest report on progress towards the Sustainable Development Goals reveals that in 2022, approximately 9.2% of the global population faced chronic hunger, which equates to about 735 million people—122 million more than in 2019. It is estimated that 29.6% of people, or 2.4 billion, lacked daily access to adequate food, representing an alarming increase of 391 million more people than in 2019.

Establishing an efficient food system with access to food for all and significant reductions in food waste is essential for protecting the environment, utilizing resources more effectively, and achieving economic, social, and health benefits. The World Meteorological Organization (WMO) and the United Nations Environment Programm (UNEP) established the Intergovernmental Panel on Climate Change (IPCC) in 1988, which now has 195 member countries. The organization's goal is to provide governments with

scientific information on the impact of climate change, and the IPCC reports are a crucial contribution to international climate negotiations.

The IPCC Special Report on Climate Change and Land highlights that the current food system (encompassing production, transportation, processing, packaging, storage, retail, consumption, loss, and waste) feeds the vast majority of the global population and supports the livelihoods of over a billion people. Since 1961, food supply per capita has increased by more than 30%, accompanied by a greater use of nitrogen fertilizers (an increase of about 800%) and water resources for irrigation (an increase of more than 100%).

However, it is estimated that 821 million people are currently undernourished, 151 million children under the age of five are stunted, 613 million women and girls aged 15 to 49 suffer from iron deficiency, and 2 billion adults are obese. The food system is under pressure from non-climatic stressors (e.g., population and income growth, demand for animal products) and climate change. These climatic and non-climatic stressors affect the four pillars of food security: availability, access, utilization, and stability. Observed climate changes are already impacting food security by increasing temperatures, altering precipitation patterns, and increasing the frequency of certain extreme events. Studies have found that observed climate changes have negatively affected yields of some crops (e.g., maize and wheat) in many regions at lower latitudes, while in many regions at higher latitudes, yields of some crops (e.g., maize, wheat, and sugar beet) have experienced positive impacts in recent decades. Warming has caused significant negative effects on yields in parts of the Mediterranean, and climate changes are impacting food security in arid regions, particularly in Africa and the high mountain areas of Asia and South America.

!! It is predicted that future climate change will increasingly impact food security.

Future climate change is expected to increasingly impact food security. This will result in a rise in grain prices by 1 to 29 percent by 2050, affecting all consumers. Consumers with low incomes are particularly at risk, leading to a projected increase in the number of hungry people by over one hundred million.

Increased carbon dioxide emissions may boost crop productivity at lower temperatures, but at the same time, it will reduce the nutritional quality of crops, leading to deficiencies in protein, zinc, and iron. The prevalence of pests and diseases will change, negatively impacting production in many regions. The risks of disruptions in the food system are also rising due to the increasing number of extreme events.

Fruit and vegetable production, a key component of a healthy diet, is also vulnerable to climate change. Yields and suitability of crops are expected to decline under higher temperatures, particularly in tropical and subtropical regions. Heat stress leads to reduced yields, lower product quality, and increased food waste, as highlighted in the IPCC report.

Many practices related to production and consumption can be strengthened to better address climate change. On the supply side, for example, increasing organic matter in soil, better managing pastures for livestock, and reducing soil erosion can contribute to climate change mitigation by reducing emissions from crops and livestock and sequestering carbon in the soil. On the demand side, adopting healthy and sustainable diets, along with reducing food waste, is extremely important. This can lead to a reduction in additional land required for food production and enhance the resilience of the food system. Healthy and

sustainable diets offer significant opportunities to reduce greenhouse gas emissions from food systems while simultaneously improving consumer health.

!! Consuming regional and seasonal food can reduce greenhouse gas emissions, provided it is grown efficiently.

A healthy and sustainable diet is rich in whole grains, legumes, fruits, vegetables, as well as nuts and seeds, with minimal amounts of energy-intensive animal-based foods and discretionary foods (such as junk food). The production of animal-based foods (e.g., meat and dairy products) emits higher quantities of greenhouse gases compared to crop cultivation, especially in intensive, industrial livestock systems. This primarily concerns ruminant products, such as beef, due to enteric fermentation processes that are significant methane emitters. Shifting diets towards lower consumption of animal-based foods reduces the need for livestock farming and shifts crop production from animal feed to human food, thereby reducing the demand for agricultural land compared to current levels. Consumer behavior changes, in addition to dietary shifts, such as reducing food waste, can also significantly impact overall greenhouse gas emissions from food systems. Consuming regional and seasonal food can reduce greenhouse gas emissions, provided it is grown efficiently. It can be concluded that agriculture and the food system are crucial for responding to global climate change. Combining actions on the supply side, such as efficient production, transportation, and processing, with interventions on the demand side, such as modifying food choices and reducing food waste, reduces greenhouse gas emissions and increases the resilience of the food system. To achieve this across the entire food system, it is necessary to create enabling conditions through policies, markets, institutions, management, and education for current and future consumers. Public health policies aimed at improving nutrition, such as sourcing healthy and local food in schools, health insurance incentives, and awareness campaigns about the importance of sustainable diets, can potentially shift demand, reduce healthcare costs, and contribute to lower greenhouse gas emissions, according to the IPCC.

REDUCING FOOD WASTE

The Sustainable Development Goals emphasize the need to provide food for a growing population while reducing food waste. Goal 12.3 aims to halve global per capita food waste at the retail and consumer levels (including hospitality and households), while simultaneously reducing losses in production and supply chains. Food waste is no longer a problem only in developed countries, as previously thought, with an average of 121 kilograms per capita discarded worldwide, according to the United Nations Development Programme (UNDP) in 2021. In Croatia, data for 2020 shows that approximately 71 kilograms of food per capita are wasted annually, totaling 286,379 tons, with 76% of food waste occurring in households, compared to the EU average of 53%. According to data from SURS, the average person in Slovenia discarded 72 kilograms of food annually in 2022, a decrease from 2021. Less waste was generated in food production (down by 21%), households (down by 12%), and food stores (down by 2%), while waste in hospitality increased by 20%. In Serbia, each citizen discards 83 kilograms of food annually, totaling 726,196 tons per year, as reported by the United Nations Environment Programme (UNEP).

The EU Green Deal, in its central strategy "From Farm to Fork," also aligns with Goal 12.3 and aims to halve the amount of food wasted at the consumer level in member states. Accordingly, EU countries must implement measures to prevent and reduce food waste, following the "Target-Measure-Act" approach.

There is little time remaining to achieve Goal 12.3, highlighting the urgent need to accelerate collective actions to reduce food loss and waste. This is crucial as it contributes to broader improvements in agricultural and food systems towards achieving global food security, enhancing food quality and availability. In the decade-long fight against food waste, everyone must actively participate in reaching this goal, including governments, local authorities, businesses, citizens, and educational institutions, which should educate new generations of conscious consumers whose choices will shape future markets.

Although young people have basic knowledge about the importance of reducing food waste and are concerned about the ecological, financial, and social pressures of food waste, they still waste significant amounts of food in their homes and schools. This demonstrates a significant gap between attitudes and behavior, influenced not only by the youth themselves but also by the surrounding food system.

According to the ESD (Education for Sustainable Development) concept, materials used in working with students should include information about problems, their causes, and possible solutions. They should aim to engage young people in global efforts to mitigate climate change, prevent food waste, and reduce economic, ecological, and social impacts. These materials should contribute to achieving the objectives of the COR (Curriculum and Outcomes Report) and enable students to connect with these topics on a personal level. It is also recommended to connect schools and exchange examples of best practices, implement projects that explore the role of water in daily life, sustainable resource management, and organize events on current global issues such as hunger, water scarcity, pollution, climate change, and food waste.

One way to change attitudes and behaviors among young people is to show them the quantity and type of food waste generated in their households. Measuring the amounts and types of food waste and understanding the reasons behind it could help students assess how much food is wasted and its associated costs. This awareness could motivate them to find ways to reduce food waste, save money, and have a positive impact on the environment. When measuring food waste, students should also be able to compare their own waste (in terms of quantity, components, and financial cost) with that of their classmates or peers. Verified information is the best way to motivate change.

Students should be taught that even small changes in food handling habits can significantly reduce waste and save money. It is also important to communicate that some level of waste will always be present in households because not all parts of food are edible, and such waste should be separated for environmentally friendly disposal.

!! Measuring the quantities and types of food waste and understanding the reasons for food wastage could help students assess how much food is discarded and its cost. This, in turn, could motivate them to find ways to reduce food waste, save money, and have a positive impact on the environment.

Young people use various criteria to assess food quality and decide whether it is still edible or should be discarded. In addition to the expiration dates listed on product labels, some rely on their sensory perceptions to determine edibility. However, there is often uncertainty about whether food is safe to eat after the expiration date. Therefore, it is crucial to enhance their knowledge on how to recognize whether food is still good to consume, which is closely related to better food purchasing, storage, and preparation skills.

Students should be provided with more information on how to evaluate the appearance, smell, and texture of food to determine its edibility. Additionally, they should be able to distinguish between food safety dates, use-by dates, and spoilage indicators. This can be facilitated by tables with information on product categories with limited, long, and very long shelf lives. Good food purchasing habits and cooking skills can also extend the life of food and reduce waste among young people.

There is a stigma associated with consuming food that is near or past its expiration date. Therefore, young people need to be convinced that it is acceptable to buy and consume products past their expiration date if they are safe to eat. This can be supported by using previously mentioned tables on product categories and shelf lives. By mastering these concepts, students would develop new habits of checking whether there are expired products among the items they buy in stores. The learning outcome is to understand when products past their expiration date are safe for consumption and that buying and consuming these products helps "save" food from being wasted.

Fostering the habit of sharing food among young people is important, and food-sharing spaces, whether physical or virtual, could be an excellent way to create a broad network of individuals with similar attitudes towards food. The food-sharing network should include as many participants as possible to ensure that surplus food offered by some members is used by others. Schools can create designated areas for food sharing, which would further encourage this type of solidarity and environmentally friendly behavior.

When young people dine out at restaurants, they often tend to create waste because they are served more food than they can eat. If they cannot finish all the food, they should take the leftovers home, store them properly, and consume them in the next meal or the following day. Therefore, encouraging a culture of taking leftovers home among students is important. Ideally, students can avoid packaging waste by bringing their own reusable food containers to restaurants, which should be highlighted as promoting socially responsible behavior. The learning outcome is to establish the habit of taking leftovers home and storing them in sustainable packaging as an acceptable social norm. Meal planning is one of the most commonly suggested solutions for reducing food waste. It's important to also think about what can be done with leftovers. Education and practical advice on how to use leftovers and ensure meal variety can be very valuable. Young people have many different food-related goals, including enjoying food and eating a variety of meals each day. Guidelines for meal planning can be used in education, taking into account the needs of different age groups and lifestyles. For example, shopping for groceries once a week might not be ideal for a young person with an unpredictable schedule. Providing more information or suggestions on how to plan meals throughout the week to avoid repeating the same meals can be helpful. Creating guidelines for weekly meal plans, including how much of each product is needed to ensure all food is used, including leftovers, is also beneficial. Meal planning saves time and money and helps enjoy a healthy and balanced diet by providing insight into the food being consumed. When planning meals, it's a good idea to include as much seasonal fruit and vegetables as possible since they stay fresh longer and are often cheaper. Students should be encouraged to buy "ugly" fruits and vegetables that have the same nutritional content but often end up as waste because they lack aesthetic appeal and are avoided by shoppers.

Students could practice measuring the amount of food needed to prepare one meal and plan their shopping according to that list. They should also think about what to do with any potential leftovers by

creating new recipes and dishes. The learning outcome is that young people can plan their diets according to their preferences and lifestyle, which helps avoid food waste.

!! Finally, donating and redistributing food is one way to reduce food waste while also strengthening the fight against poverty and hunger with a positive impact on the environment. When there is an efficient food donation system, the amount of collected food can reach very high levels and be redistributed to thousands of socially disadvantaged individuals. In a donation system, it is crucial that the food distributed to the end user is safe for consumption, which is why safe donation practices must be followed. Educating students about proper food donation practices while also strengthening their connection with the local community is important.

TOPIC 2

WATER

Due to climate change, water resources will become increasingly threatened. Through education for sustainable development, SDG 4, students can understand what changes affect water resources and how, as well as the consequences – both globally and locally. They are the future generation of creators and decision-makers, and it is important for them to embrace sustainability from an early age so they can find better solutions for preserving nature and water resources and adapt better to changes than we have. Water use has globally increased by approximately 1% per year over the last 40 years and is expected to continue growing at a similar rate until 2050, considering the growth in the planet's population, socio-economic development, and changing consumption patterns. Most of this increase is concentrated in middle and lower-income countries, particularly in developing economies. Water scarcity is becoming endemic as a result of the local impact of physical water stress, along with the acceleration and spread of freshwater pollution. All countries, regardless of income level, show signs of water quality risks. Poor water quality in low-income countries is often associated with low levels of wastewater treatment, while in higher-income countries, the impact of intensive agriculture is a more serious source of water quality problems. However, data on water quality remains scarce, largely due to weak monitoring and reporting, especially from many of the least developed countries in Asia and Africa.

SUSTAINABLE DEVELOPMENT GOALS RELATED TO WATER

Without water, there is no life, which is why it is connected to many sustainable development goals. Let's take a closer look at them.

1. No Poverty

The UN defined extreme poverty in 1995 as "a condition characterized by severe deprivation of basic human needs, including food, drinking water, sanitation, health, shelter, education, and information." Extreme poverty is often measured by an income of less than 1.7 euros per day per individual.

2. Zero Hunger

In countries where development is hindered by extreme hunger, food shortages often occur due to environmental destruction, droughts, and loss of biodiversity.

3. Health and Well-being

Ensuring healthy lives and promoting well-being at all ages is key to sustainable development. This goal includes access to clean drinking water, without which there is no life.

6. Clean Water and Sanitation

In 2022, there are still 2.2 billion people who do not have regular access to drinking water, 703 million of whom do not even have basic needs guaranteed. Sustainable water management also impacts sustainable food production, energy use, and better economic growth. Moreover, we can take care of aquatic ecosystems, biodiversity, and take measures against climate change.

11. Sustainable Cities and Communities

More than half of the world's population lives in urban areas, and by 2050, it is expected that 70% of the population will live there. About 1.1 billion people currently live in slums, and this number is expected to reach 2 billion in the next 30 years. The quality of drinking water and waste reduction are key challenges in developing cities.

12. Responsible Consumption and Production

The Earth's resources are dwindling, and the population is growing. If we reach 9.8 billion by 2050, we would need three planets to have the natural resources to live the way we do now. We must change our shopping habits and start using sustainable energy sources. Among other measures, reducing the use of plastic, which is a major pollutant of the seas, is important. Drinking from durable bottles rather than disposable ones is a small step that goes a long way.

13. Climate Action

The biggest challenge of climate change is global warming. If we do not take action, the temperature will rise by 3°C and damage ecosystems. In addition to extreme weather events such as storms, floods, and fires, we will face threats such as hunger and water scarcity. This can lead to new conflicts.

14. Life Below Water

Oceans are essential for life on Earth. They cover three-quarters of the Earth's surface and contain 97% of the planet's water, representing 99% of the living space by volume. Pollution, particularly plastic, is increasing rapidly; it was 17 million tons in 2021 and is expected to double or triple by 2040. Oceans absorb up to 23% of CO_2 and help mitigate the greenhouse effect. The sea is also becoming more alkaline, which affects living organisms. If we can reduce our plastic consumption, we can do a lot for the oceans globally.

15. Life on Land

Ecosystems on Earth are essential for our survival. Life on land is not possible without water. Water is our blue gold. We can help by recycling, eating locally, consuming sustainably produced food, and not creating waste.

!! We can help by recycling, eating locally, consuming sustainably produced food, and not creating waste.

Sustainable Development Goals Quiz

Survey (research.net)

Exercise: Test your knowledge about the sustainable development goals

WATER IN THE WORLD AND CLIMATE CHANGE

The science is clear about climate conditions: they are changing and will continue to change, which will affect society and the environment. This directly impacts hydrological systems, where people's access to water and its quality are changing, and we are experiencing more extreme events. The changes are also

reflected indirectly: water consumption demands are shifting, affecting food security, energy production, and the economy. Climate change will also impact water-related diseases.

The risk of water scarcity is rising in many areas, particularly in Central and South Asia and Northern Africa. 2.4 billion people live in areas where water supply is threatened, and 800 million live in very critical conditions.

The developed world is responsible for most climate changes due to greenhouse gases. These consequences are primarily visible and will be even more so in the tropical belt, where there are fewer developed countries. The situation worsens because poorer countries struggle more with the consequences of climate change, making the poorest societies the most susceptible to various changes. Many poorer countries find it harder to adapt and mitigate the effects of climate change. They also lack basic knowledge of water management, even in the case of disasters.

Developed countries are reluctant to take full responsibility for climate change. This led to the concept of climate justice, which asserts that climate change is both an ethical and political issue. (Water & Climate Change)

Access to water leads to better jobs, and people move to wealthier areas. As you can see, the issues of climate change and water are complex and intertwined, and they are also intergenerational. Current decisions will be felt by future generations, so it is necessary to think about them and make decisions together with them. In recent decades, there has been a growing number of academic studies and specializations in the fields of water and climate change, so future generations will be better equipped to deal with these problems. Educators have an extremely important role in educating and raising awareness among young people.

CLIMATE CHANGE AND WATER IN EUROPE

IN OUR COUNTRIES

As mentioned at the beginning of the manual, due to ice melting, sea levels are rising. In Europe, it is expected to rise by an average of 60 to 80 cm by the end of the century. About one-third of the EU population lives in this zone. It is also concerning that the rise in sea levels reduces the amount of available fresh water because seawater penetrates groundwater, which can affect agriculture and drinking water supply.

It will also impact biodiversity in coastal habitats. Many wetlands will be lost, endangering unique bird and plant species and removing the natural protection these areas provide against storm floods. We also mentioned the deterioration of water quality due to droughts and rising temperatures, which encourage the growth of bacteria and toxic algae. Heavy rainfalls can lead to the runoff of untreated wastewater into surface waters. European rivers mostly originate in mountainous areas, and 40% of Europe's fresh water comes from the Alps. Changes in snow and glacier dynamics can lead to temporary water shortages across Europe (European Commission, Consequences of Climate Change). Southeastern and southern Europe are among the most vulnerable because temperatures are rising, and precipitation is decreasing. Water availability is decreasing, and the risk of droughts, biodiversity loss, and forest fires is increasing.

!! The developed world is responsible for most climate change due to greenhouse gases.

In Slovenia, we can expect warmer summers, longer growing seasons, and increased strength and frequency of extreme precipitation. Groundwater levels and large flows will increase, particularly in the eastern part of the country.

The food production and agriculture sector in Serbia accounts for 10% of GDP, but in recent years it has experienced significant losses, primarily due to intensified periods of drought. For example, in 2012, drought caused losses amounting to 2 billion dollars. Several factors contribute to these losses. First, the combination of high temperatures and more intense solar radiation causes damage to plants (e.g., on fruits), reducing yields. Second, high temperatures promote the development of pathogens that thrive in warmer conditions, attacking crops. Third, due to the lack of irrigation over large areas, crops depend on natural precipitation, which has become increasingly variable due to climate change. As a result, longer periods without rain threaten the harvest. (United Nations Development Programme, Observed Climate Changes in Serbia and Projections of Future Climate Based on Various Emission Scenarios, Belgrade, 2018).

Another aspect of climate change's impact on water systems is intense rainfall in short time intervals, which can cause flooding. Like droughts, floods have immediate effects on agriculture and human health. We witnessed this during the summer of 2023, when atypical storm winds with intense precipitation for the Balkan region caused massive damage to agriculture and food production. This also led to an increase in food prices on the market. (Climate Adaptation Program with Action Plan, Ministry of Environmental Protection of the Republic of Serbia).

INTEGRATING SUSTAINABLE DEVELOPMENT GOALS AND WATER INTO THE LEARNING PROCESS

Teachers have many opportunities to integrate sustainable development content into students' education. They can be included in these subjects:

Mandatory subjects: Environmental studies, social studies, natural sciences and technology, natural sciences, geography, civic and patriotic education, and ethics.

Elective subjects: Geography - human life on Earth and exploring the local city and protecting its environment, ecological education I, II, and III, agriculture - modern agriculture, plants and humans, and studying organisms in the local environment.

Project days

Extended stay

Nature school

Extracurricular activities

We have discussed the climate challenges we face in the area of water. Through learning objectives in education about sustainable development goals, students learn what it means to have an abundance of water versus a shortage of water, both for people and for the economy. They develop an understanding of conscious water consumption and change unsustainable consumption patterns.

TOPIC 3

ENVIRONMENT

THE ENVIRONMENT AS A SOURCE OF FOOD

Humans have always strived, and continue to strive, to better understand nature and the opportunities it offers. One of the fundamental reasons is that nature provides food and water, which are essential for survival. Nature is a vast, inexhaustible source that is still underutilized. Of the approximately 350,000 plant species on Earth, about one-third are edible, yet humans actually consume only around 600 species. Of the approximately 2 million animal species, around 50 are eaten. This means that a vast wealth of food provided by nature remains untapped. The main reasons for this are ignorance, entrenched dietary habits, prejudices, fear of poisoning, and disgust. Deeply ingrained habits, which are often poor, frequently lead to improper nutrition and hinder improvement through the application of well-known and accepted nutritional principles, including the introduction of cultivated and domesticated foods and dishes into the diet.

Today's "modern" fruits, vegetables, and domestic animals are the result of numerous efforts in cultivation and selection over many years, or even centuries. The original wild species of the world's most important crops evolved and spread thanks to nature—humans, wind, water, and animals. Humans have also experimented over time and created conditions for cultivation. This is a process that geneticists call domestication, and farmers call agriculture. Today's crops do not resemble their more primitive ancestors; for example, the original apples were neither as large nor as varied in flavor and color as those we have today. Researchers have determined the origins of crops using genomics and cultural records. Indeed, when in contact with humans, the evolution of a plant is often altered. Today, scientists, using their knowledge of the history of food, can improve the quality of what we will serve on our plates tomorrow. Europe discovered agriculture around seven thousand years BCE, which was associated with migrations from Anatolia. New people from the Near East first settled in southeastern Europe, initially focusing on the territory around the major rivers, primarily the Danube, and then spread throughout Europe. This marked the beginning of the Neolithic way of life in Europe, which introduced permanent settlement, cereal cultivation, the use of fish in the diet, and the beginning of thermal food preparation, distinct from the previous raw consumption.

Much later, Christopher Columbus, in 1492, through his voyages and the discovery of America, initiated the Age of Exploration and the "Columbian Exchange," which changed the world as it was known until then. The consequences of his great adventure have so profoundly marked our daily lives that it is hard to imagine the environment differently, especially due to the richer food supply. The new types of food exchanged with America and Asia became so integrated over time that it is difficult to imagine how different things were 500 years ago.

When we look at a plate and a menu today compared to the past, the differences are very noticeable. It’s hard to imagine that our ancestors 500 years ago lived without corn, tomatoes, or tobacco. Many of these are now considered native, completely overlooking their true origins. Cooked, fried, or popped corn, homemade polenta (pura or žganci) are an indispensable part of our tradition, while chocolate,

chestnut puree, blackberry wine, hazelnuts, and vanilla are part of our modern needs. Thanks to the great transoceanic discoveries and voyages, the world has become smaller, and tables richer with a variety of ingredients and dishes. Moreover, biological diversity has reached enormous proportions. Biological and genetic diversity in agriculture is crucial for the sustainable development of agricultural production and rural areas. How surprised would Herodotus, the “father of history,” be if he could see new and unknown fruit species like oranges, lemons, and mandarins growing on Mediterranean coasts, which the Arabs brought from the Far East? All medieval European rulers would be bewildered to see corn, tobacco, potatoes, and tomatoes in their regions, which came from the American continent. And how would Mendel react if he saw the results of his genetic experiments with peas?

This could be a successful story and a significant advancement for human civilization over a span of 12,000 years. But we must admit that our way of life exceeds all ecological limits.

LINK https://overshoot.footprintnetwork.org/

!! EARTH OVERSHOOT DAY Each year, we are warned about the increasingly rapid exceedance of the limits we refer to as Earth Overshoot Day. This is the date when humanity's demand for ecological resources and services in a given year exceeds what the Earth can regenerate in that year. In 2023, this date was August 2nd as an average date, since each country has its own overshoot day. The estimate for 2024 is April 25th for Slovenia, May 28th for Croatia, and May 23rd for Serbia, certainly something we cannot be proud of.

Agriculture as a Food Factory

Everything that affects the air, water, and soil also affects our food, and therefore, us. Humans must remember that we are just one part of the nutrient cycle in nature and are intimately connected with all processes. What we throw into the water or on the land eventually comes back to us on our plates. There seems to be a human tendency to first destroy everything we can and then begin the process of "repair." This applies to materials, cultural heritage, interpersonal relationships, and especially nature. Our delusion that we are more powerful than nature and can control it has unfortunately led to catastrophic destruction whose consequences we will feel long-term. In a way, the “malfunction” of nature has achieved the “best” results, so now there is an abundance of techniques, models, and methods aimed at returning things to reasonable, initial conditions. Or, to use colloquial language, to “factory settings.” It is not entirely illogical to use the term "factory" in relation to agriculture and animal husbandry, as fields are indeed food factories that need regular maintenance. Given humanity's need to feed an increasing number of people on the planet (especially those who are financially capable), to grow more food in less time, and to transport and process that food, the development of agriculture has been one of the more aggressive means of depleting the Earth's natural resources. The agriculture we know has largely contributed to the creation of problems that are becoming more pronounced each day: climate change, global warming, environmental degradation, and health issues affecting both producers and consumers. Whether traditional or modern, agriculture has led to the devastation of land as a production base and other factors over time. Farming practices to achieve desired results, namely yields, generally require excessive use of fertilizers, pesticides, and herbicides. This leads to changes in soil composition, a decrease in organic matter, and alterations in chemical properties, especially the pH level of the soil. Land that has undergone these changes is no longer capable of adequately absorbing water, its biological activity decreases, and this leads to an ongoing cycle of using new inputs and measures. A

particular problem is the leaching of these substances into deeper soil layers, which causes water pollution and, indirectly through evaporation, air pollution.

The near-total destruction of windbreaks contributes to increased aeolian erosion, further degrading the quality of surface soil layers. Aeolian erosion is a significant issue in Vojvodina due to strong winds. For example, during months without crops, strong winds can lead to the loss of 5 kg of nitrogen, 10 kg of phosphorus, 11 kg of potassium, and 0.9 tons/ha of organic matter due to aeolian erosion on 85% of the arable land in Vojvodina. This greatly affects soil fertility.

Installing windbreaks aligns with air mass movement, so when the air encounters the windbreak, it partially passes through the tree canopies within the break and mostly flows over the windbreak. This achieves the desired effect of allowing stronger winds to pass over the land and continue in the same direction at a considerable distance. Properly constructed windbreaks in areas prone to strong winds can significantly mitigate these negative effects. However, wind also carries away residues of pesticides, mineral fertilizers, weed seeds, and invasive species. Since this carried material ends up in rivers, canals, and open surface waters, the issue extends beyond mere loss of soil fertility and quality to a serious problem of water and air pollution.

Additionally, windbreaks reduce evaporation rates, lower CO_2 levels, provide habitats for fauna and insects (including pollinators and predators), and importantly, lower temperatures by 3-4°C. This issue has become even more relevant today as many local plant and animal populations have disappeared or been reduced to a few varieties due to the development and modernization of agricultural production. Furthermore, settlement and colonization of new areas have led to reductions, and even the elimination, of certain plant and animal species.

Throughout the last century, several disease epidemics have been recorded as a result of reduced genetic variability, leading to drastic reductions in production. Since the mid-20th century, organized efforts, particularly through FAO, have been undertaken to preserve existing genetic diversity in plants and animals.

Genetic resources, as an element of biodiversity, are particularly vulnerable to adverse factors such as climate change, diseases and pests, harmful technologies, infrastructure developments, and non-scientific selection methods. Their preservation and harmonious use are crucial for development. Genetic resources form the basis for creating new varieties and improving existing ones. To prevent irreplaceable losses of plant and animal resources and to preserve the gene pool, which may be valuable for future selection, appropriate measures for their conservation are essential.

A particular issue in the correlation between food waste and the environment is packaging waste (from all stages, from production to the consumer) which ends up in landfills, unsanitary dumps, and in nature, particularly in rivers that are often connected to drinking water sources. Europe aims for environmentally friendly waste management and has a range of policies in place. However, the average European generates 5 tons of waste annually, with only 38% of waste being recycled, and 60% of household waste still being sent to landfills.

Sustainable Production as a Solution

In modern agriculture, the practice of cultivating a single crop species over large areas often leads to reduced biodiversity within crop communities and has numerous negative effects, including increased

incidence of diseases and pests, which results in higher pesticide use and greater environmental pollution. Therefore, measures that contribute to biodiversity and soil regeneration are particularly valuable.

The transition from intensive (conventional) agriculture to alternative or sustainable agriculture, which is more environmentally friendly, involves incorporating ecological principles into food production. Unsustainable use of land and marine ecosystems has led to uncertainties in agriculture and fishing, impacting food supply. The only way to address these issues is through ecosystem restoration based on nature-based solutions.

Approximately 80% of the world's arable land is affected by at least one form of degradation, with soil erosion impacting one-fifth of agricultural lands worldwide. Land and soil are non-renewable resources, and their degradation continues to undermine their functions and service-providing capabilities. Estimates indicate that soil erosion increased by about 2.5% from 2001 to 2012, primarily due to deforestation and increased arable land area, according to UNEP. Degradation affects around 3.2 billion people, and projections suggest that it could reduce food productivity by 12%, leading to higher food prices.

Over 60% of European soils are unhealthy, and scientific evidence shows that soils are further degrading due to unsustainable land management, sealing, contamination, and overexploitation, combined with the impact of climate change and extreme weather events. LINK
https://environment.ec.europa.eu/topics/soil-and-land/soil-health_en

In Slovenia, between 2020 and 2022, there was a reduction in the cultivation of agricultural land (good soil) and an increase in land urbanization, resulting in irreversible land degradation and loss of natural resources. Urbanization, particularly the development of high-quality agricultural land, reduces the potential for food self-sufficiency and the range of ecosystem services provided by high-quality agricultural land. In 2022, Slovenia had 853 square meters of arable land and gardens per capita, which is significantly less compared to other regions. Approximately 2,500 square meters of arable land and gardens per capita is considered sufficient for food security and self-sufficiency.

The focus is on preserving and improving the "health" of the soil as the foundation of plant production, which is crucial for all branches of agriculture. Increasingly, agricultural practices are incorporating the recycling of organic waste by leaving more agricultural waste on fields and adding composted material. Composting, explained in terms of chemical processes, is the aerobic decomposition of organic matter that occurs naturally without human intervention through natural decay and breakdown processes. By composting, we are essentially reducing our debt to nature from which we take more and more each year. Scientists have discovered that healthy soil contains between 50-80 percent carbon, primarily in the form of bacteria, fungi, decomposing plant material, insects, and earthworms. Compost contributes to this by providing a medium that supports the work and survival of microorganisms and small insects. This creates a cyclical process, eliminating the need for organic waste disposal at landfills, which poses a significant problem as it is highly flammable. The decomposition of organic waste at landfills produces high temperatures and explosive methane gas, which often leads to fires and the release of harmful, carcinogenic gases, smoke, soot, and dust. Additionally, composting eliminates the burning of crop residues, which has a more detrimental effect by directly destroying soil quality and structure. Composting in situ, as part of sustainable agriculture, is also more economical because it reduces the need for machinery. The global situation with pollution and food is affecting the transformation of not

only rural but also urban landscapes. Urban gardening is recognized as the production, processing, and distribution of food in urban, city, and suburban areas. It can encompass various types of production beyond traditional gardening, such as raising small animals and fish, smaller forest plantations or forest gardening, and urban beekeeping. This model of gardening provides easier access to local food production and has significant sociological and educational aspects. In addition to reducing poverty and hunger, it strengthens community bonds, whether among families or other social units.

A crucial role is also played in reducing the ecological footprint by shortening transportation and imports, which have environmental impacts. Urban gardening also involves diverse groups of people, often including marginalized or vulnerable individuals.

The benefits of urban gardening align with the Sustainable Development Goals outlined in the 2030 Agenda. Participatory approaches that encourage multifunctional land use, diversity of participants, and spatial and temporal interactions among people allow for the full potential of urban gardening to be realized. Gardening was once associated with rural areas and older people, but increasingly, younger generations are getting involved. Urban gardening has been an established practice in cities for quite some time, though interest in it can fluctuate, as it is doing right now. Urban farms are becoming more popular among various groups of people. LINK https://cityfarms.org/

Approximately 800 million people are involved in urban food production, contributing nearly 15% of the world's food supply. One of the best examples is Germany, specifically Berlin, where the concept of urban gardens has been established since the 19th century. The primary motivation was to utilize abandoned land for cultivation, providing multiple benefits for the community and individuals. The COVID-19 pandemic has significantly altered many of our habits and needs. Isolated and with limited access to food, many opted for their own production, using balconies, communal courtyard spaces, home gardens, and even unconventional places like parking lots, dumpsters, or building rooftops for growing vegetables. Thus, new trends in gardening emerged due to these changed circumstances. The popularity of urban gardening today is evident from the fact that 12,000 Berliners are currently waiting for their plot in an urban garden. Urban beekeeping on rooftops is also notable in cities like Paris, Ljubljana, and Belgrade. LINK https://www.ecoconceptpogon.rs/urbano-pcelarstvo/

Children and adults learn about growing, caring for gardens and plants, and participate in hands-on work. MetroFarm, a community garden in Prague, serves as a model of synergy between urban gardening and farming. At MetroFarm, vegetables are grown from seedlings to finished products, domestic animals are rescued and live freely, composting is practiced, and alternative irrigation methods are utilized. LINK https://www.metrofarm.cz/en/ Cologne is an example of a "food city," where citizens grow food either on their balconies or on communal land. The city model is inspired by certain English and American cities. You can read about how the project works and how citizens participate in the text https://essbare-stadt.koeln/

Sustainable development implies development that is permanently or long-term aligned with the capabilities and limitations of the ecosphere. The exploitation of limited resources and environmental pollution have their limits. Current generations must align economic and overall development with these limitations to ensure at least the same quality of the environment for future generations. The foundation of sustainable development is the integration of economic and ecological goals and their alignment. Therefore, incorporating sustainable development goals into educational curricula is of crucial importance.

GENERAL RECOMMENDATIONS FOR ENVIRONMENTAL EDUCATION FOCUSED ON SDGs

Appendix 1: Methodological Guide for Educators

Sustainable Development Goals (SDGs) are the action-oriented component of the 2030 Agenda for Sustainable Development, which was adopted by 193 United Nations member states in 2015. Together, the Agenda and Goals represent a shared plan for peace and prosperity for people and the planet. The 2030 Agenda fundamentally embodies a vision for improving our world, making it both complex and universal. The SDGs serve as an urgent call for change across all countries, both developed and developing. Education for Sustainable Development (ESD) emerged from the need to provide education that equips young people to constructively and creatively address current and future global ecological, social, and political challenges, thereby fostering the creation of sustainable and resilient societies. ESD aims to enhance access to quality basic education, realign curricula, train and raise public awareness, and help individuals develop the behaviors, skills, and knowledge necessary to transform society into a sustainable one. This guide supports school policies and infrastructure in helping students make decisions aligned with the Sustainable Development Goals (SDGs). It assists teachers in integrating SDGs and key competencies for sustainable development into curricula and implementing them in their lessons. This encourages schools to connect with the community and explore how parents, organizations, and companies can support them. By carrying out the activities provided in the guide, a comprehensive environment is created where SDGs related to water, food, and the environment are effectively integrated into the curriculum of primary schools.

The concept is based on a needs analysis conducted during previous partner projects and throughout the project proposal preparation. It encompasses all necessary information, suggestions, instructions, and useful tools for guiding teachers and, subsequently, students through education related to the SDGs. The methodological approach and instructions support teacher training in planning, preparing, and structuring goal-oriented and practical learning. The didactic concept considers various prior knowledge, competencies, cognitive styles, learning goals, and expectations of the target group (teachers, pedagogues, school boards, principals, students), as well as the learning/work circumstances, different contexts, and levels of existing SDG integration mechanisms in partner countries. The guide provides knowledge and instructions on how to use tools and best practice examples. These will help students develop the skills and competencies needed to become change-makers for the sustainability of water, food, and the environment through innovative teaching tools. Education for Sustainable Development (ESD) for 2030 focuses on the central role of education in achieving the Sustainable Development Goals (SDGs), directly contributing to SDG 4 on quality and inclusive education, and specifically to target 4.7.

In the Republic of Croatia, the school curriculum introduces an interdisciplinary theme of Sustainable Development, which includes three dimensions of sustainability – ecological, social, and economic – and their interdependence. This prepares students for appropriate actions in society aimed at achieving personal and collective well-being. According to the curriculum, Sustainable Development is integrated into mandatory and elective subjects, classroom teaching, integrated teaching, projects, extracurricular activities, field trips, and other out-of-school activities.

!! Sustainable Development Goal 4.7: By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development through education for sustainable development and sustainable lifestyles, human rights, gender equality, as well as to promote a culture of peace and non-violence, global citizenship, respect for cultural diversity, and contribution to sustainable development.

In the elective program for Education for Sustainable Development, the theme of Water focuses on water that students interact with daily, specifically water from their surroundings. The proposed content aims to help students understand water quality, sources of pollution and their impact on local waters, the effects of landfills, agriculture, and industry on water pollution in their community, as well as the consequences of cleaning agents and detergents used in households on the environment and health, and the irrational use of water, among other topics.

The contents for the sub-theme Water within the interdisciplinary field of Education for Sustainable Development also include knowledge about water safety, water use and pollution, households, landfills, industry, agriculture, etc. However, this sub-theme also encompasses broader knowledge, such as the Millennium Declaration, surface and groundwater, water in our bodies, water as a resource, water energy, biodegradable and non-biodegradable components, recreational water use, and water purification systems, etc. The approach involves research, discussion, and small project creation. The focus is not on connecting, highlighting benefits, or ways of action.

In Slovenia, guidelines for education and training on sustainable development from preschool to higher education were adopted as early as 2007. In 2023, the National Institute for Education of the Republic of Slovenia prepared an online edition of the Comprehensive Program on Awareness and Education and Training on Climate Change in the context of VITR for kindergartens, primary schools, and secondary schools. What is missing are qualified educators for the implementation of sustainable development content. Schools that wish to do so can consider integrating sustainable development content into compulsory and extended programs, activity days, extended stay, engaging activities, and nature schools. It is recommended to plan sustainable development as interdisciplinary units of learning. The use of modern didactic approaches and technologies is encouraged. Education should encompass work both inside and outside the classroom, with a starting point of directly observing events and the actions of people from students' daily lives. The concept of Education for Sustainable Development (ESD) is defined by three domains: Connection, Action, and Well-being, which function as an integrated whole.

Connection involves understanding fundamental principles of sustainability and interdependence within ecosystems. It answers the question: What? Action refers to the active spreading and application of relevant knowledge and skills for sustainable living. It addresses the question: How? Well-being encompasses responsibilities and rights in achieving the desired goal, providing benefits for all people, the environment, and future generations. It answers the question: Why? As globalization continues to bring about economic, social, and political transformation, and the world becomes increasingly interconnected through greater mobility, new technologies, and social changes, Education for Sustainable Development (ESD) has become more important than ever. In response, over the past decade, and through advocacy led by international organizations, educational systems worldwide have gradually integrated ESD content into educational policies, curricula, and teacher training. Every educational system must undergo the necessary changes to transform the world into a fairer and more sustainable place, as our shared future depends on our current actions, as highlighted by UNESCO in the Roadmap for Education for Sustainable Development. To move towards a sustainable future, we need to

reassess what, where, and how we learn to develop the knowledge, skills, values, and attitudes that enable us to make informed decisions and take individual and collective actions at local, national, and global levels to address the most pressing issues. To prepare students of all ages for such a "challenge," ESD empowers them with knowledge, skills, values, and attitudes to make mature decisions and take responsibility for actions that ensure environmental integrity, economic sustainability, and a just society that empowers people of all genders while respecting cultural diversity. This lifelong learning process enhances cognitive, social, emotional, and behavioral dimensions. Being holistic and transformational, it involves learning about content and outcomes and is recognized as a key driver of all SDGs aimed at transforming society. The United Nations General Assembly once again reaffirms Education for Sustainable Development (ESD) as an integral part of the Sustainable Development Goals for quality education and a key driver for all other goals (UN General Assembly Resolution 72/222, 2017). ESD is a crucial component of quality education. Its special emphasis on competencies related to empathy, solidarity, and taking action can help build a future where education contributes not only to individual success but also to the collective survival and advancement of the global community. It also helps shift the global educational agenda away from an exclusive focus on access and quality measured by learning outcomes, toward a greater emphasis on the content of learning and its contribution to the sustainability of the planet, thereby connecting SDG 4 with all other goals.

Pedagogy and Learning Environment: Utilizes project-based interactive pedagogy and student-centered pedagogy. This will transform all aspects of the learning environment through a holistic approach to SDGs and enable students to live what they learn and learn what they live.

Social transformation: Enables the achievement of SDGs towards building a more sustainable world.

Learning Outcomes: Empowers individuals to take responsibility for current and future generations and actively contribute to social transformation.

Learning Content: Integrates sustainability issues, especially those embedded in the 17 SDGs, such as climate change, into all forms of learning.

Key Considerations for Education for Sustainable Development 2030 According to UNESCO Include:

✓ Transformative Action: Fundamental changes needed for a sustainable future start with individuals. ESD must emphasize how each student can undertake transformative actions for sustainability, including the importance of exposing students to reality and how their actions can drive social transformation towards a sustainable future.

✓ Structural Changes: ESD must address deep structural causes of unsustainable development. It should seek to balance economic growth with sustainable development, encouraging students to explore alternative values beyond those of consumer societies, and take a structural perspective on addressing ESD in the context of extreme poverty and vulnerability.

✓ Technological Future: ESD must respond to the opportunities and challenges posed by technological advancement. While technology may resolve some "old" problems, new challenges and risks will arise. Critical thinking and sustainability values become increasingly relevant, as teaching ESD may become more challenging with the illusion that technology alone can solve most sustainability issues.

We aim for the goal and purpose of Education for Sustainable Development 2030 to achieve a world in which:

- Governments incorporate ESD into their educational policies and frameworks for educational transformation.
- Students from all walks of life around the world have the opportunity to acquire the knowledge, skills, values, and attitudes necessary to promote sustainable development and achieve the 17 SDGs
- People living in cities and communities around the world recognize ESD as a key tool and opportunity for lifelong learning to achieve sustainability at the local level
- Teachers around the world have the opportunity to develop capacities to drive social transformation towards a sustainable future
- Teacher training institutions systematically integrate ESD
- Youth are empowered to be change-makers, and youth organizations systematically provide training for young people and youth educators on ESD

!! To encourage students to become change-makers who have the knowledge, resources, willingness, and courage to undertake transformative actions for sustainable development, educational institutions must undergo transformation.

Schools, colleges, and universities need to align with the principles of sustainable development, primarily in their curricula and pedagogy, to create an environment where students learn what they live and live what they learn. Educational leaders, including principals and school administrations, should develop concrete, time-bound plans for implementing a comprehensive institutional approach to ESD in collaboration with teaching staff and the local community. One potential measure is to ensure democratic decision-making processes from the bottom up, where all members of the institution and other stakeholders can have a say in the specific sustainability challenges the institution needs to address. The facilities and processes themselves should embody sustainability principles. This can include, for example, energy-efficient buildings, sustainable transportation options for staff and students, and the procurement of locally produced sustainable products. Collaboration with the local community and parents, as well as with stakeholders from the NGO and private sectors working on sustainability, should be developed to provide a valuable environment for interdisciplinary project-based learning focused on sustainability.

Capacity building for teachers is crucial because teachers remain key actors in enabling students to transition to a sustainable way of life. Teachers can help students understand the complex choices required by sustainable development and motivate them to transform themselves and society. To lead and empower students, teachers themselves must be empowered and equipped with the knowledge, skills, values, and behaviors necessary for this transition. This includes understanding the key aspects of each of the 17 Sustainable Development Goals and their interconnections, as well as understanding how transformative actions occur and which pedagogical approaches best promote them. Moreover, continuous support should be provided to teaching staff in building their capacities, including offering guidelines for policy and source materials to facilitate the integration of Education for Sustainable Development (ESD) into curricula and training programs. Teachers should be encouraged to network for the exchange of best practices and collaboration. Well-trained, supported, and valued teachers are crucial for providing quality education for all and achieving the educational goals of the 2030 Agenda.

According to UNESCO, there is a global shortage of 69 million teachers, representing one of the biggest challenges in increasing the supply of qualified and motivated teachers through improved policies and support for quality training that meets students' needs. The teacher shortage has become a global phenomenon affecting both developing and developed countries, significantly hindering the achievement of global and national educational goals. Current and future generations of young people will have to face the consequences of unsustainable development. On the other hand, youth are becoming increasingly vocal and active, demanding urgent and decisive changes and holding global leaders accountable, especially for addressing the climate crisis. Additionally, young people are a significant consumer group, and the way their consumption patterns evolve will greatly influence the sustainability trajectory of their countries. Therefore, empowering and mobilizing youth is a central part of implementing Education for Sustainable Development (ESD).

Young people could use online communities and other communication channels to share messages about the urgency of sustainability challenges, advocate for the inclusion of ESD in their educational environments, and take action for social transformation. Groups, organizations, and networks that guide and mentor youth should create opportunities for them to empower each other with knowledge, skills, values, and attitudes. This includes developing advocacy skills for the urgency of sustainable development. At the same time, decision-makers and members of public and private institutions must recognize youth as key participants in all efforts to promote sustainable development. Specifically, young people must be fully involved in the design, implementation, and monitoring of policies and programs related to education and sustainable development. Ensuring guaranteed seats for youth representatives in decision-making bodies at all levels is one way to achieve this. Efforts should also focus on accelerating activities at the local level and in everyday life. The local community is where people find partners for their sustainability efforts, and thus, active collaboration between educational institutions and the local community should be promoted to ensure the application of the latest knowledge and practices for sustainable development to improve the local environment.

Local public authorities, including municipal governments, city councils, and educational offices, in coordination with community stakeholders, should develop an action plan on how the entire community can become a learning laboratory for sustainable development and an essential component of Education for Sustainable Development (ESD). This plan should provide opportunities for all citizens to become agents of change. Furthermore, local public authorities, in coordination with all stakeholders, including civil society organizations, private companies, and local media, should ensure the development of capacities among local decision-makers, public opinion leaders, and the broader public for implementing Sustainable Development Goals (SDGs) at the local level. Providers of formal and informal education within the community should coordinate their programs to address the SDGs and related local sustainability challenges in a coherent manner. Additionally, policymakers at the national level should encourage and support the efforts of local communities and coordinate them as part of the national strategy on Education for Sustainable Development (ESD) and the national contribution to achieving the Sustainable Development Goals (SDGs). This includes providing incentives for local authorities to integrate localized ESD into curricula and programs, as well as embedding ESD into lifelong learning systems. People in local communities should actively engage with key sustainability challenges, develop skills to compare different future scenarios for their communities, embrace values and attitudes that

support a more sustainable future, participate in public decision-making processes, and act as responsible community members.

Increased global warming, rising climate change-related natural disasters, massive biodiversity loss, and widespread pollution all indicate that urgent sustainable solutions are needed, which can only emerge from knowledge and action. We continue to live beyond our ecological means in ways that disproportionately impact the most vulnerable, further entrenching persistent inequalities. At the same time, we are witnessing the rise of violent ideologies and ongoing conflicts fueled by the pandemic of false information and conspiracy theories. Addressing these challenges requires an urgent need to prepare students of all ages to engage with the world as responsible and concerned citizens contributing to the pursuit of sustainable solutions. Education must be a pathway to personal transformation, which can lead to the societal changes needed to address global issues and create a more sustainable, peaceful, and equitable world for all.

Teachers have the power to help students develop the knowledge, skills, values, and behaviors needed to respond to global challenges in building a fairer, more peaceful, and sustainable world. However, a global survey conducted by UNESCO and Education International, published in the report "Teachers Say," shows that although many teachers are motivated, a quarter still does not feel prepared to teach topics related to Education for Sustainable Development (ESD). At the same time, teachers feel least confident about teaching sustainable consumption and production, which is crucial for the necessary behavioral transformation to start living within our ecological limits.

It is encouraging that over 90% of respondents believe that ESD issues are important, and more than 80% want to continue learning about them. Governments, educational policymakers, academics, and teacher educators need to work together to meet this need and support teachers in addressing significant global challenges in the classroom, thereby realizing their potential as change-makers for social justice, human rights, peace, and sustainable development. In the mentioned study, only one-third of teachers feel confident in explaining topics related to the Sustainable Development Goals (SDGs) to their students. While they understand the importance of teaching Education for Sustainable Development (ESD) and are motivated to teach these critical subjects, their enthusiasm is often overshadowed by a lack of available resources and structural support. Teachers need greater support from schools, training institutions, communities, educational systems, and governments if they are to succeed in instilling principles and behaviors that promote more sustainable lifestyles in the next generation. Legislators, educational policymakers, curriculum developers, academics, teacher educators, textbook authors, school managers, and non-teaching staff should take steps to create a supportive environment for teaching ESD. Evaluating ESD is challenging for teachers, as nearly 40% of respondents face significant difficulties in assessing students' ability to act according to ESD principles. More than one-third of respondents lack tools or guidelines for evaluating interdisciplinary topics. However, teachers use non-traditional assessment methods to bridge these gaps. Teachers report that their education does not adequately cover topics related to sustainable consumption and production, and climate change. Nevertheless, teachers with higher education and classroom experience feel more capable and confident in teaching these subjects.

!! Almost 40% of respondents face significant challenges in assessing students' ability to act in line with ESD principles. More than one-third of respondents lack tools or guidelines for evaluating interdisciplinary topics. However, teachers use non-traditional assessment methods to bridge these

gaps. Teachers report that their education does not adequately cover topics related to sustainable consumption and production, and climate change.

Teachers surveyed say that the lack of coverage of ESD topics is the biggest systemic barrier to teaching these subjects. Curricula overloaded with other subjects mean they have little time to teach ESD. It is clear that teachers need more educational resources for ESD (in terms of content, materials, and guidelines) to support their teaching in an engaging and innovative way. Schools, especially in rural areas, do not provide sufficient resources and support to help teachers implement ESD in an appealing and effective manner. Less than half of the respondents report that their schools have action plans on climate change or sustainability, or resources available for school trips. In providing quality and relevant ESD teaching and learning materials, we believe that this Erasmus+ project will foster professional development and teacher education through the provided materials, which will serve as teaching tools. The pilot project in three countries involves teachers themselves as co-creators of teaching materials and methods. This approach encourages teacher autonomy and creates a supportive school environment for teaching ESD, as well as broader collaboration with other schools, NGOs, and the private sector.

Studies show that ESD is most effective in changing student behavior when teachers use affective, action-oriented, and student-centered approaches rather than transmissive teaching methods. Many pedagogies and methods are designed to actively engage students and provide inclusive learning because mere teaching about sustainable development will not foster the attitudes, values, and behaviors needed to help students become responsible and proactive global citizens.

!! OBSERVATION

Look at the current situation, see what is already happening in your context, and try to describe it. This can contribute to a shared understanding of what the situation is or what has happened and can prove critical before, during, or after action, reflection, and celebration.

CELEBRATION

Moments of celebration can help students reflect and shape their ideas, actions, and strengths, and also give them time to show pride in what they have achieved, share what they have learned, and understand the impact of their ideas. Celebrations can be a small exhibition, sharing feelings and knowledge among students, inviting relevant people for discussion, recording videos, songs, or series of photographs. The celebration should be joyful for all students.

IMPACT

We want to learn what we live and live what we learn. It allows us to explore and experience our environment and apply our observations and reflections to create deeper understanding and positive change. Students take responsibility for their own learning by designing, creating, solving problems, taking risks, and learning from failure.

REFLECTION

Setting aside moments for reflection provides opportunities for individual and collective thinking. It also allows for considering and analyzing multiple perspectives and alternative explanations. Reflection can be triggered before, during, or after each activity through classroom discussion, debates, role-playing, brainstorming, mind mapping, diagrams, etc.

Education for Sustainable Development (ESD) requires learning to occur along three complementary and interconnected dimensions:

Cognitive Learning involves knowledge, understanding, and critical thinking about global, regional, national, and local issues. It includes the interconnectedness and interdependence of different countries and populations, as well as the social, economic, and ecological aspects of these issues.

Social and Emotional Learning builds emotional awareness and social skills necessary for children and youth to interact with others in a positive and respectful manner. This involves fostering a sense of belonging to a shared humanity and emphasizing shared rights, responsibilities, and common destinies.

Behavioral Learning refers to the ability to act effectively and responsibly at local, national, and global levels to contribute to a peaceful and sustainable world. The active approach proposed by UNESCO focuses on transformative learning.

To enhance the effectiveness of Education for Sustainable Development (ESD), the proposed methodology should incorporate:

Theoretical Instruction with Relevant Data: Utilize materials from the project, such as handbooks and presentations, to provide foundational knowledge and context.

Group Work: Engage students through group activities that promote inclusion and participation.

Field Visits to Best Practice Examples: Carefully select and visit examples of best practices, incorporating the experiences from these visits into the learning process.

Testimonials/Case Studies: Use real-life examples of successful practices to illustrate effective approaches and outcomes.

Learning Through Action: Implement projects where students apply their knowledge and skills in real-world scenarios.

Practical Lessons: Include hands-on activities such as gardening, cooking courses, recycling, and composting to provide practical experience.

Peer Education: Foster collaboration between students from different grades and schools to facilitate peer learning and exchange of ideas.

To create a peaceful and sustainable world for current and future generations, education must focus on the creation of a sustainable future. Education for sustainable development (ESD) is not just about understanding sustainable development but also about taking action. This approach aligns education with the development of general cross-disciplinary competencies.

The connection between ESD and general cross-disciplinary competencies is complex. Sustainable development issues—such as poverty reduction, peace-building, ethics, local and global responsibility, democracy, justice, security, human rights, health, gender equality, cultural heritage, rural and urban development, sustainable production and consumption, corporate responsibility, environmental protection, natural resource management, biodiversity, and others—are multifaceted and not confined to any single subject area.

For this reason, these issues are suitable for educational work aimed at developing all general cross-disciplinary competencies. Through this project or the SustainStudy manual, in line with the Framework for Education for Sustainable Development, we will connect the Sustainable Development Goals that are directly and indirectly related to the theme of water – food – environment.

UNESCO - Education for Sustainable Development (ESD)
https://unesdoc.unesco.org/ark:/48223/pf0000247444

Appendix 2: Worksheets for Teaching

1. The Whole World on a Plate
2. What Does Our Food Look Like?
3. From Field to Plate
4. Healthy Snacks – Say No to Junk Food
5. What's in Our Fridge and on Our Plates?
6. Create a Healthy Meal
7. What Do We Do with Food We Didn't Eat?
8. Is a Landfill a Good Place for Discarded Food?
9. Composting in Our Garden and Nature
10. How to Make Nutritious Compost at Home?
11. Food Waste as an Energy Source
12. How Do Water and Terrain Affect Food Production?
13. Water Has a Taste
14. Water from Discarded Food
15. Virtual Water
16. Example of Related Workshops – Where Is Water Connected to Food?
17. Example of Class Preparation Using Worksheets
18. Introductory Questionnaire
19. Evaluation Form
20. Appendices to the Worksheets

WORKSHEET 1: THE WHOLE WORLD ON A PLATE

Age Group: 6-14 years

Class Type: Practical work, workshop, research, peer collaboration

Background: (Starting Point): Students gain knowledge about the origins of the food species we use, learn to recognize them, and acquire basic knowledge about these species.

Outcomes: Students gain insight into how new foods in some parts of the world have changed dietary practices, reduced or caused hunger, and the impact of water on these changes. They will make interdisciplinary connections through the given topic.

Activity Duration: Activities can be conducted independently or together, for each age group or through peer education transfer, lasting 4+4 classes.

Teaching Materials: Paper, scissors, colored pencils, glue, construction paper, cardboard, computer use, presentation creation

Correlations: History, Geography, Art, Native Language and Culture, Informatics, Nature and Society (World Around Us), Biology

SDGs:

SDG 1 - No Poverty

SDG 2 - Zero Hunger

SDG 3 - Good Health and Well-being

SDG 6 - Clean Water and Sanitation

SDG 11 - Sustainable Cities and Communities

SDG 12 - Responsible Consumption and Production

SDG 13 - Climate Action

SDG 14 - Life Below Water

SDG 15 - Life on Land

SDG 17 - Partnerships for the Goals

Activity 1: The Great Geographical Discoveries

Activity 2: I Am a Potato and I Was Born in America

Activity 1: The Great Geographical Discoveries

Age Group: 6-14 years

Class Type: Practical work, workshop, research

Number of Lessons: Four

Outcomes: Students develop research and teamwork skills while gathering information about transoceanic voyages, discoveries, and food routes, as well as the climatic and edaphic conditions for growing certain types of plants and animals. They acquire skills in teamwork, presentation preparation, and peer communication or knowledge transfer.

Student/Team Activities: Formulate a research question and hypothesis: Where does our food originate from?

Create a world map

Prepare the necessary research materials (list all required items)

Follow instructions from geography and history teachers to conduct research

Record the required data

Draw conclusions upon completing the research

Adjust or supplement notes as needed

Discuss results with the teacher

Prepare to transfer knowledge to younger students aged 6-10 years

Present their work on food origins and transoceanic voyages and discoveries to younger students

Teacher's Activity: Instruct students on how to properly use literature and the internet, how to identify important information, and how to utilize it for further work. Facilitate discussions with students after obtaining results and guide them on how to create a presentation for younger students. Oversee students during their presentations to younger students and provide additional explanations if necessary.

Activity Description: Students, in discussion with history and geography teachers, analyze previously studied lessons on transoceanic voyages and the explorations of Christopher Columbus and other navigators. They aim to reconstruct events, focusing on Columbus’s discoveries of rich plant and animal life and what followed after his return to Europe.

Using various techniques, students may create a travel map, present the plant and animal life brought from distant continents to Europe, and show how it spread across Europe from Spain, the first landing point. They will explore how many of the ingredients we use, which we think are local, actually came from afar.

Activity 2: I Am a Potato and I Was Born in America

Age Group: 6-10 years

Research Focus: Food Origins

Class Type: Practical work, workshop, learning through play

Number of Lessons: Four

Outcomes: Students develop the ability to identify types of fruits, vegetables, and meats used in our diet. Based on presentations by older students on transoceanic voyages, discoveries, and food routes, they connect the foods they use with continents through play.

Student/Team Activities:

Task: Draw as many food items used in our diet as possible and prepare them as cards with well-illustrated images that they can color.

Create a World Map: Make a world map to represent the origins of the food items.

Prepare Materials: Gather necessary materials for drawing and card preparation.

Follow Instructions: Conduct the activity according to the teacher's instructions.

Learning through Play: Learn about food items through play and connect them with continents.

Draw Conclusions: Summarize findings at the end of the activity.

Teacher's Activity:

Guide Students: Instruct students on how to effectively use what they have learned, identify important information, and apply it for further work.

Lead Discussion: Facilitate a discussion with students after obtaining results and guide them in creating the planned materials, such as food cards.

Activity Description:

Older students have shared with younger groups, in a way appropriate for their age, the story of Columbus's discoveries and the plants and animals that arrived in Europe from the New World. Based on this, younger students, with their teachers, will create cards to use in a game. They will draw as many examples as possible on sturdy paper or cardboard.

Game Description:

Setup: One student will receive a picture of a plant or animal attached to their back so they cannot see it. Gameplay: By asking questions to the group and based on their responses, the student will guess what plant or animal is depicted and place it on the world map to indicate its origin.

WORKSHEET 2: WHAT DOES OUR FOOD LOOK LIKE

Age Group: 6-14 years

Class Type: Practical work, workshop, research, peer collaboration

Background: (Starting Point): Students gain knowledge about the origins of the food species we use, learn to recognize them, and acquire basic knowledge about these species.

Outcomes: Students will be able to recognize plants from their environment, name them, and distinguish their parts. They will identify which parts of plants are used for food, understand the process of growing plants for consumption, and explore the connection between plants and water from various aspects.

Activity Duration: Each activity lasts two school periods

Teaching Materials: Paper, scissors, colored pencils, glue, construction paper, computer use, presentation creation

Correlations: Biology, Nature and Society (World Around Us), Art, Mathematics, Informatics, Native Language and Culture

SDGs:

SDG 1 - No Poverty

SDG 2 - Zero Hunger

SDG 3 - Good Health and Well-being

SDG 6 - Clean Water and Sanitation

SDG 11 - Sustainable Cities and Communities

SDG 12 - Responsible Consumption and Production

SDG 13 - Climate Action

SDG 14 - Life Below Water

SDG 15 - Life on Land

SDG 17 - Partnerships for the Goals

Activity 1: Parts of Plants and Their Uses (6-10 years)

Activity 2: The Water Cycle Through Our Food (6-14 years)

Activity 3: How Plants Store Water (10-14 years)

Activity 4: Food for Us in Water (6-10 years)

Activity 1: Parts of Plants and Their Uses

Age Group: 6-10 years

Research Focus: Appearance of Our Food

Class Type: Practical work, workshop, learning through play

Number of Lessons: Two

Outcomes: Students develop the ability to distinguish between different parts of plants and understand their use in food.

Student/Team Activities:

Task: Draw as many plants used in our diet as possible.

Prepare Materials: Gather materials needed for drawing.

Follow Instructions: Conduct the activity according to the teacher's instructions.

Learning Through Play: Learn about food items and connect them with our dietary habits through play.

Draw Conclusions: Summarize findings at the end of the lesson.

Teacher's Activity: Instruct students on how to effectively use what they have learned, identify important information, and apply it for further work. Lead discussions with students after obtaining results.

Activity Description: Students, together with the teacher, analyze their eating habits by listing the fruits and vegetables they consume and drawing them on paper. After this, they complete a task to identify which parts of the plant they are familiar with and determine which parts of the plant are eaten in each example. They then explore why they eat these specific parts, what happens to the other parts, and whether they would be willing to try eating other parts.

Activity 2: The Water Cycle Through Our Food

Age Group: 10-14 years

Research Focus: Plant Transpiration

Class Type: Practical work, workshop, peer education

Number of Lessons: Two

Outcomes: Students, based on their knowledge of biology and chemistry, will understand how transpiration works and how water circulates through plants.

Student/Team Activities: Observe plants in both natural and controlled environments. Observe one set of plants that are watered and another set that is not. Follow the teacher's instructions to carry out the experiment. Analyze and conclude the results of the experiment. Create drawings representing the process of transpiration. Get ready to present the findings to younger students.

Teacher's Activity: Instruct students on how to use literature and the internet effectively, how to identify and extract important information for further work. Lead discussions with students after obtaining results and guide them on how to create a presentation for younger students.

Activity Description: Optionally, wrap the plant pot with plastic wrap, although it's not necessary. Place a plastic bag over the top of the plant and secure it tightly around the base of the stem. Leave the plant overnight. In the morning, you will find that the plastic bag is fogged up. The inside walls of the bag will have water droplets from evaporation. This water is what the plant has released. This is similar to observing dew on grass blades in the morning. Students will use this simple experiment to demonstrate plant transpiration, helping them visualize how water moves through plants.

Materials Needed: A plant with lush green foliage, plastic wrap (optional), and a plastic bag.

Activity 3: How Plants Store Water

Age Group: 6-10 years

Research Focus: How Our Food Breathes and Drinks Water

Class Type: Practical work, workshop, learning through play

Number of Lessons: Two

Outcomes: Students develop the ability to connect and transfer knowledge. Older students present their findings on transpiration to younger students, who, by relating this to lessons on plant parts, understand the connection between plants, water, and our food.

Student/Team Activities: Gather materials needed for drawing: paper, colored pencils, construction paper, and collage images. Conduct the activity according to the teacher's instructions. Draw a plant with labeled parts. Compare the water cycle in nature with the water cycle in plants, identifying similarities. Summarize findings at the end of the activity.

Teacher's Activity: Instruct students on how to use the knowledge gained from older students, identify important information, and apply it for further work. Lead discussions with students after obtaining results and guide them on creating a presentation for younger students.

Activity Description: Students will mark the movement of water through the plant on their drawings: Indicate where the plant gets its water (rain or watering); Show how the plant absorbs water. Illustrate how water moves through the plant.Demonstrate how water evaporates from the plant.

Discussion Topics: Why do plants need water? What role does water play in plants? What happens to plants when they are thirsty? Do some plants store water? Explore these and other related questions during the workshop.

Simple Example: Soak the stems of white flowers in colored liquid. Students can observe how the plant pulls up the colored liquid, changing the color of the flower over the course of the class or day.

Activity 4: Our Food from Water

Age Group: 6-10 years

Class Type: Practical work, workshop, learning through play

Number of Lessons: Two

Outcomes: Students develop the ability to identify and differentiate between food sources from land and water. They will explore and understand what types of food we can obtain from water environments like oceans and rivers.

Student/Team Activities: Draw as many food items from water (e.g., fish, seaweed) that are used in our diet and prepare them as cards. Either make a world map or use the map from Activity 1 and 2 in Worksheet 1. Gather materials needed for drawing and card preparation: paper, colored pencils, pens, collage images, glue, and cardboard. Follow the teacher's instructions for the activity. During the activity, students learn about water-based food items and connect them to the types of water environments in which they live and their continents of origin. Summarize findings at the end of the activity.

Teacher's Activity: Instruct students on how to effectively use literature and the internet to gather information. Help them identify key information for further use. Lead discussions with students after obtaining results and encourage them to think about how these types of food are represented in their diet and potential improvements.

Activity Description: Students, with the help of teachers, will deepen their understanding of aquatic life forms used in our diet. This includes organisms from rivers, lakes, or the sea. They will create cards with images of aquatic animals or plants used in food on one side and a brief description on the other. Each card should be made in duplicate. Students will play a matching game by pairing image cards with text cards.

WORKSHEET 3: FROM FIELD TO TABLE

Age Group: 6-14 years

Lesson Type: Practical work, workshop, exploration, peer collaboration

Background: Students gain knowledge about the origin of the species we use for food. The emphasis is on understanding the processes of growing specific types of food.

Outcomes: Students will be able to recognize plants in their environment, name them, and distinguish plant parts. They will observe differences between plant parts and identify which parts are used for food. They will learn about the process of growing food plants and their use in nutrition. They will understand the connection between plants and water from various aspects.

Teaching Materials: Paper, scissors, crayons, glue, construction paper, computer use, presentation creation, garden creation, seeds, seedlings

Correlations: Nature and society (the world around us), mathematics, visual arts, technical education, native language and speech culture

Duration of Activities: Four class periods per activity

SDGs:

SDG 1 – No poverty

SDG 2 – Zero hunger

SDG 3 – Good health and well-being

SDG 6 – Clean water and sanitation

SDG 11 – Sustainable cities and communities

SDG 12 – Responsible consumption and production

SDG 13 – Climate action

SDG 14 – Life below water

SDG 15 – Life on land

SDG 17 – Partnerships for the goals

Activity 1: Food Guardians (Seed Collection)

Activity 2: Sowing

Activity 3: Water in Food Production

Activity 1: Food Guardians

Age Group: 6-10 years

Lesson Type: Practical work, workshop, learning through play

Number of Lessons: Four

Outcomes: Students will develop the ability to identify types of vegetables used in food and understand how these plants are obtained. They will distinguish where seeds are found in different types of plants, whether some seeds are edible or not, and how to separate seeds from other plant parts and store them.

Student/Team Activities: Draw as many food items used in nutrition and prepare them as cards. Create seed packets according to a template. Prepare materials and tools needed for drawing and making cards: paper, crayons, glue, scissors, cardboard. Follow the teacher's instructions to carry out the activity. Learn about seeds through play and connect them with plants during the activity. Draw conclusions at the end of the session

Teacher Activities: Instruct students on how to properly use literature and the internet to find important information for their work. Guide students in identifying and using relevant information for further activities. Lead a discussion with students after analyzing the results

Activity Description: Students are assigned to bring various types of vegetables and fruits from home that they like to eat, as well as others. In class, they will determine where seeds are located, whether some seeds are edible, how seeds differ from each other, and their similarities to plants. They will find associations to help them better recognize seeds.

Appendix: Seed packet template

Activity 2: Sowing

Age Group: 6-10 years

Research Work: Growing Food

Lesson Type: Practical work, workshop, learning through play

Number of Lessons: Two

Outcomes: Students will develop the ability to independently sow vegetables by selecting seeds and planning the spacing and depth of planting properly.

Student/Team Activities: Bring brick packaging containers from home to use for initial sowing activities. Prepare materials needed for drawing and making labels for planting containers: paper, crayons, glue, scissors. Follow the teacher's instructions to carry out the activity. Draw conclusions at the end of the workshop

Teacher Activities: Guide students on how to properly carry out the sowing process

Activity Description: Students will cut one side of the brick packaging containers to create planting pots. With the help of the teacher, they will fill these pots with nutrient-rich substrate. Using the seeds they previously collected, they will create combinations of plants to sow. All the pots will be placed in trays and positioned near a light and heat source. Students will water the plants and discuss with the teacher how to care for and monitor the germination of the plants.

Activity 3: Water in Food Production

Age Group: 6-10 years

Research Work: The connection between water and food, in the production and survival of plants; exploring the concept of virtual water

Lesson Type: Practical work, workshop, learning through play

Number of Lessons: Two

Outcomes: Students will develop the ability to think critically about the water needs of plants and animals used in food production. They will explore how these needs are met, whether they are the same for all, and how much water pollution occurs. Students will also be introduced to the concept of virtual water.

Student/Team Activities: Draw as many food items as possible that are used in nutrition

Prepare materials and tools needed for drawing and making cards

Follow the teacher's instructions to carry out the activity

Learn about food items and their water needs through play during the activity

Explore the concept of virtual water using the internet

Draw conclusions at the end of the lesson

Teacher Activities: Guide students on how to properly use literature and the internet, helping them identify and extract important information for further work

Lead a discussion with students after analyzing the results

Activity Description: Students will engage in a discussion with the teacher, analyzing the appearance and ingredients of the food they enjoy eating. This conversation will lead them to explore the basic raw materials used—plants and animals—and how they are cultivated, with a particular focus on the role of water. They will analyze the various aspects and needs for water in food production. Students will explore websites to learn about the concept of virtual water. Each student will then choose to analyze the water needs of one plant and one animal.

https://www.waterfootprint.org/water-footprint-2/what-is-a-water-footprint/

WORKSHEET 4: HEALTHY SNACK – SAY NO TO JUNK FOOD

Age Group: 6-14 years

Lesson Type: Practical work, workshop, exploration, peer collaboration

Background: Students gain knowledge about proper and nutritious eating habits and how to make the right food choices for themselves, especially at school.

Outcomes: Students will understand the importance of making healthy snack choices for their development, school performance, and the environment.

Duration of Activities: Each activity lasts for 2 lessons

Teaching Materials: Paper, computer use, presentation creation

Correlations: Nature and society (the world around us), biology, geography, native language and speech culture, visual arts, civic education

SDGs:

SDG 1 – No poverty

SDG 2 – Zero hunger

SDG 3 – Good health and well-being

SDG 6 – Clean water and sanitation

SDG 11 – Sustainable cities and communities

SDG 12 – Responsible consumption and production

SDG 13 – Climate action

SDG 14 – Life below water

SDG 15 – Life on land

SDG 17 – Partnerships for the goals

Activity 1: School Snack

Activity 2: Continental, River, and Sea Snack

Activity 1: School Snack

Age Group: 6-14 years

Research Work: School Snack

Lesson Type: Practical work, workshop

Number of Lessons: Data is recorded in a table after each recess at school, over four weeks

Outcomes: Students will develop a sense of responsibility for their own health and gain new knowledge about proper nutrition. By the end of the workshop, students will be able to independently assess the quality of their school snack.

Student Activities: Formulate a research question and hypothesis: What kind of snack do we receive at school?

Create a table for data collection

Prepare the necessary tools for conducting the research

Follow the teacher's instructions to carry out the research

Record the required data

Draw conclusions at the end of the research

Revise or supplement notes if needed

Discuss the results with the teacher

Teacher Activities: Guide students on how to correctly fill out the table and lead a discussion with students after analyzing the results.

Activity Description: Each student receives tables to fill out daily over a four-week period. During these four weeks, representatives from the Institute of Public Health or similar organizations will visit the students. They will have discussions with their teachers. At the end of the four weeks, students will analyze their individual tables as well as the collective data from all students. The results should be presented to school meal planners, kitchen and cafeteria staff, and parents.

Appendices: Table 1 and Table 2

Activity 2: Continental, River, and Sea Snack

Age Group: 6-14 years

Research Work: School Snack

Lesson Type: Practical work, workshop

Number of Lessons: Two lessons

Outcomes: Students will develop a sense of responsibility for their own health and gain new knowledge about proper nutrition. By the end of the workshop, students will be able to independently assess the quality of school snacks.

Student Activities:

Formulate a research question and hypothesis: What kind of snack would we like to have at school?

Prepare the necessary tools for conducting the research

Follow the teacher's instructions to carry out the research

Record the required data

Draw conclusions at the end of the research

Revise or supplement notes if needed

Discuss the results with the teacher

Teacher Activities: Instruct students on how to correctly fill out the table and lead a discussion with students after analyzing the results.

Activity Description: Students will engage in discussions with their teachers about the results of monitoring how much school snacks are consumed versus how much is wasted, and why. They will work to draw conclusions about why certain types of food are wasted more than others. Following this, students will suggest how their snack could be more nutritious and aligned with the region they live in. They will independently propose ideas for making their snack healthy and suitable for the local environment.

WORKSHEET 5: WHAT'S IN OUR FRIDGE AND ON OUR PLATE

Age Group: 6-14 years

Lesson Type: Practical work, workshop, research, peer collaboration

Background: Students will analyze their household diet and food waste.

Outcomes: Students will gain insight into how their dietary habits impact the environment, both through the food production process and food waste.

Teaching Materials: Paper, pencils, crayons, glue, scissors, poster board, cardboard, magazine photos, computer use, presentation creation

Correlations:

SDG 1 – No poverty

SDG 2 – Zero hunger

SDG 3 – Good health and well-being

SDG 6 – Clean water and sanitation

SDG 11 – Sustainable cities and communities

SDG 12 – Responsible consumption and production

SDG 13 – Climate action

SDG 14 – Life below water

SDG 15 – Life on land

SDG 17 – Partnerships for the goals

Activity 1: Analysis and Monitoring of Food Waste in the Household

Activity 2: How Do We Plan Purchases and Meals at Home?

Activity 3: What Attracted Me in a Food Advertisement?

Activity 1: Analysis and Monitoring of Food Waste in the Household

Age Group: 6-14 years

Research Work: Students monitor how much food is wasted at home over the course of one week

Lesson Type: Practical work, workshop

Outcomes: Students will develop a sense of responsibility for environmental protection and awareness of the amount of food wasted and unused.

Student Activities:

Formulate a research question and hypothesis: How much food do we waste?

Create a table for data collection

Prepare the necessary tools for conducting the research

Follow the teacher's instructions to carry out the research

Record the amount and type of food wasted each day at home

Log the required data

Draw conclusions at the end of the research

Revise or supplement notes if needed

Discuss the results with the teacher

Teacher Activities: Guide students on how to properly fill out the table and lead a discussion with them after analyzing the results, raising awareness about the harmful effects of food waste.

Activity Description: In collaboration with their teachers, students will either create a table or use a pre-made one to monitor food waste in their households over an agreed period. After this, they will analyze the data and hypothesize why the results are as they are, working to find explanations and solutions to change the behavior around food waste.

Activity 2: How Do We Plan Purchases and Meals at Home?

Age Group: 6-14 years

Research Work: Students monitor food waste at home over one week and propose better solutions based on their observations

Lesson Type: Practical work, workshop

Outcomes: Students will develop responsibility for environmental protection and awareness of the amount of food wasted and unused.

Student Activities:

Formulate a research question and hypothesis: How can we reduce the amount of food we waste?

Create a table or plan for purchasing

Prepare the necessary tools for conducting the research

Follow the teacher's instructions to carry out the research

Conduct a survey with household members about their food preferences and needs for the upcoming period

Record the required data and propose a shopping plan based on it

Analyze the results after the food has been purchased according to the proposed plan and track the amount of waste

Revise or supplement notes if needed

Discuss the results with the teacher

Teacher Activities: Guide students on how to correctly fill out the table and lead discussions with them after analyzing the results, raising awareness about the harmful effects of food waste.

Activity Description: Based on lessons about healthy eating and the season in which the workshop is conducted, students will choose a menu. They will consider quantities and expiration dates of products. They will plan the menu in advance and develop a shopping plan based on it. This process involves careful consideration and budgeting. The results can be presented visually in an engaging way.

Activity 3: What Attracted Me to Food Advertisements?

Age Group: 6-14 years

Research Work: Students investigate and analyze food marketing materials and advertisements

Lesson Type: Practical work, workshop

Outcomes: Students will develop awareness about environmental protection and the amount of wasted and unused food.

Student Activities: Formulate a research question and hypothesis: Why do we buy that specific type of food?

Prepare the necessary tools for conducting the research

Collect flyers and promotional brochures from major supermarkets

Follow the teacher's instructions to carry out the research

Record the required data: type of food, appeal, and advertising message

Draw conclusions at the end of the research

Revise or supplement notes if needed

Discuss the results with the teacher

Teacher Activities: Guide students on how to properly conduct the research and draw conclusions.

Activity Description: Students will collect marketing materials from available supermarkets and analyze them during class. They will examine which types of food are most advertised, the advertising messages used, and why certain ads attract customers. The conclusion should address whether the food purchased due to the advertisement was actually needed or if the advertisement had an impact and in what way. At the end of the activity, students can create their own advertisement for a product they would like to sell or an ad that would genuinely appeal to them due to the value of the food.

WORKSHEET 6: CREATE A HEALTHY MEAL

Age Group: 6-14 years

Type of Class: Practical work, workshop, research, peer collaboration

Background (Starting Point): Students gain knowledge about the nutritional values of the food they consume.

Outcomes: Students gain insight into how certain types of food are beneficial or harmful to their body and plan a healthy and sustainable meal based on this information.

Duration: Each activity lasts 2 hours

Teaching Materials: Paper, scissors, colored pencils, glue, chart paper, use of computers, creating presentations

Correlations: Nature and society (the world around us), biology, civic education, visual arts, native language and speech culture, mathematics

SDGs:

SDG 1 - No Poverty

SDG 2 - Zero Hunger

SDG 3 - Good Health and Well-being

SDG 6 - Clean Water and Sanitation

SDG 11 - Sustainable Cities and Communities

SDG 12 - Responsible Consumption and Production

SDG 13 - Climate Action

SDG 14 - Life Below Water

SDG 15 - Life on Land

SDG 17 - Partnerships for the Goals

Activity 1: Plan a Rational Food Purchase Based on Healthy and Sustainable Eating Rules

Activity 2: Create a Colorful Plate

Activity 1: Plan a Rational Food Purchase Based on Healthy and Sustainable Eating Rules

Age Group: 6-14 years

Research Work: Students conduct research and workshop activities to plan food purchases and meals.

Type of Class: Practical work, workshop, peer collaboration

Outcomes: Students develop responsibility towards environmental protection and awareness about the amount of food wasted and unused.

Student Activity:

Formulate a research question and hypothesis: What does a healthy and sustainable meal look like?

Create a table and sketch for planning food purchases

Prepare materials needed for conducting the research

Follow the teacher's instructions to conduct the research

At home, record the types and quantities of food they plan to buy for themselves and their family members

Analyze the recorded data to ensure it aligns with the principles of healthy and sustainable eating

Teaching Materials: Paper, colored pencils, glue, chart paper, use of computers

Teaching Activity:

Guide students on how to create tables and sketches for their plans

Assist students in understanding the principles of healthy and sustainable eating

Facilitate discussions on the environmental and health impacts of their planned food purchases

Draw conclusions at the end of the research.

Adjust or supplement notes if necessary.

Discuss results with the teacher.

Teaching Activity: Guide students on how to properly plan meals and food purchases while adhering to healthy and sustainable practices. Lead discussions with students about their findings and collaboratively analyze proposed meal plans. Help students consider what constitutes rational and sustainable eating in a family setting. Evaluate each family member's needs, preferences, and eating habits. Select ingredients based on the weekly meal plan and prioritize items with biodegradable or multi-purpose packaging. Assist students in visiting markets and farmers' markets to better understand food options. Represent their plans through drawings and photographs.

Teaching Materials: Paper, colored pencils, glue, chart paper, use of computers.

Description of Activity: Students reflect on what constitutes rational and sustainable eating within a family. They assess the needs, preferences, and eating habits of each family member, select ingredients

according to the meal plan for the upcoming week, and choose items with biodegradable packaging or reusable containers. To enhance their planning, they may visit markets and farmers' markets. Students present their findings and meal plans through drawings and photographs.

Activity 2: Create a Colorful Plate

Age Group: 6-14 years

Research Work: Students design their ideal meal.

Type of Lesson: Practical work, workshop, peer collaboration

Outcomes: Students develop a sense of responsibility towards environmental protection and awareness about food waste and unused food.

Student Activities: Formulate a research question and hypothesis: How can we plan a healthy meal while respecting nature?

Create a table for planning their ideal meal.

Prepare the materials needed for the activity.

Follow the teacher's instructions to conduct the research.

At home, track the quantity and type of food wasted each day.

Record the required data.

Observe a presentation by older students and ask questions.

Draw conclusions at the end of the research.

Adjust or supplement notes if necessary.

Discuss the results with the teacher.

Teacher's Activity: Guide students on how to correctly fill out the table and lead discussions on the results. Raise awareness about the harmful effects of food waste.

Description of Activity: Older students share their research on meals and virtual water with younger students. Based on this information, younger students plan their perfect meal on a colorful plate by drawing ingredients and calculating the amount of virtual water according to the older students' instructions. During this workshop, older students help younger ones understand the concept of virtual water and principles of healthy eating.

Resources: https://www.thewaterweeat.com/

WORKSHEET 7: WHAT DO WE DO WITH THE FOOD WE DIDN'T EAT?

Age Group: 6-14 years

Class Type: Practical work, workshop, research, peer collaboration

Background: Students gain knowledge about the value of the food they consume and find solutions to ensure that as little leftover food as possible ends up in the landfill.

Outcomes: Based on previous knowledge and workshops, students will understand the value of food, not only for their health but also regarding resource consumption, especially water, for its production. They will now find solutions to ensure that uneaten food does not end up in the landfill but is used instead.

Activity Duration: Each activity lasts 2 hours

Teaching Materials: Paper, scissors, crayons, glue, construction paper, use of computers, creating presentations

Correlations: Nature and Society (the world around us), Biology, Chemistry, Physics, Civic Education, Visual Arts, Mother Tongue and Language Culture, Information Technology

SDG 1 - No Poverty

SDG 2 - Zero Hunger

SDG 3 - Good Health and Well-Being

SDG 6 - Clean Water and Sanitation

SDG 11 - Sustainable Cities and Communities

SDG 12 - Responsible Consumption and Production

SDG 13 - Climate Action

SDG 14 - Life Below Water

SDG 15 - Life on Land

SDG 17 - Partnerships for the Goals

Activity 1: Leftover Food on My Plate - What Now?

Activity 2: Donating Food

Activity 1: Leftover Food on My Plate - What Now?

Age Group: 6-14 years

Research Type: Students track the journey of discarded food or uneaten food at home or school, seeking solutions to minimize food ending up in landfills.

Class Type: Practical work, workshop, research, peer education

Outcomes: Students develop responsibility towards environmental protection and awareness of the amount of food waste and unused food.

Student Activities: Formulates a research question and hypothesis: How can we save discarded food?

Creates a table

Prepares materials needed for research

Conducts the research as instructed by the teacher

Records the amount and type of food discarded each day at home

Records the necessary data

Draws conclusions at the end of the research

Revises or updates notes as needed

Discusses the results with the teacher

Teacher Activity: Guides students on how to properly analyze discarded food and think about possible actions to take with it.

Description of Activity: Based on the analysis of discarded snacks and food at home, students explore methods and models for preserving, repurposing, donating, composting, and avoiding food waste in landfills. During this workshop, students might: Develop recipes for reusing leftover food from meals.

Establish contact with institutions that accept food donations, and gather information on the conditions for such donations.

Investigate how to store food surplus at home effectively.

Learn about composting and how it works.

Resource: https://www.bbcearth.com/news/regeneration-food-waste

Activity 2: Donating Food

Age Group: 6-14 years

Research Work: Students explore options for donating food.

Class Type: Practical work, workshop, research work, peer collaboration

Outcomes: Students develop responsibility for environmental protection and awareness about the amount of food wasted and not used.

Student Activities:

Formulate Research Question and Hypothesis: How and to whom can we donate food?

Gather necessary materials for conducting research.

Follow teacher's instructions to carry out research.

At home and in school, record the quantity and type of food discarded each day, and connect with nearby markets.

Keep a record of the collected data.

Draw conclusions based on the research findings.

Make necessary corrections or additions to notes.

Discuss the results with the teacher.

Teacher Activities: Guides students on how to properly research and communicate on this topic

Description of Activities: Based on previous analyses of how much snack and food is discarded in households, students in groups (older and younger) plan what can be done to save food and prevent it from ending up in landfills. The emphasis is on donation. They create a list of organizations that accept donations, contact them about collection and distribution options for surplus food. These can include organizations caring for abandoned animals, farms, as well as solidarity or community kitchens, shelters, and similar entities when dealing with factory-packed food, market vegetables that are discarded due to appearance, etc.

WORKSHEET 8: IS A LANDFILL A GOOD PLACE FOR DISCARDED FOOD?

Age Group: 6-14 years

Class Type: Practical work, workshop, research, peer collaboration

Background: Students gain knowledge about the value of the food they consume and find solutions to minimize the amount of discarded food ending up in landfills.

Outcomes: Based on previous knowledge and workshops, students gain insights into the value of food, not only for their health but also regarding resource consumption, particularly water, for its production. They now analyze why a landfill is the worst solution for discarded food.

Duration: The first two activities last 2 hours each, while the third activity requires a full day or several hours.

Teaching Materials: Paper, scissors, crayons, glue, large paper, use of computers, creation of presentations

Correlations: Nature and society (the world around us), biology, chemistry, physics, information technology, civic education, visual arts, native language and speech culture

SDGs:

SDG 1: No Poverty

SDG 2: Zero Hunger

SDG 3: Good Health and Well-being

SDG 6: Clean Water and Sanitation

SDG 11: Sustainable Cities and Communities

SDG 12: Responsible Consumption and Production

SDG 13: Climate Action

SDG 14: Life Below Water

SDG 15: Life on Land

SDG 17: Partnerships for the Goals

Activity 1: Analysis of Landfills and the Processes Happening There

Activity 2: How Dangerous Is Food Packaging?

Activity 3: Visiting a Landfill / Preparing for a Visit

Activity 1: Analysis of landfills and the processes occurring there

Age Group: 6-14 years

Research Work: Students track at home how much food is discarded in a week and which part of that food ends up in the trash bin or is taken to the landfill.

Class Type: Practical work, workshop

Outcomes: Students develop responsibility for environmental protection and awareness of the amount of food wasted and not used.

Student Activity: Formulates a research question and hypothesis: Why is it dangerous to dispose of food waste in landfills?

Creates a diagram of the landfill and the processes occurring there

Prepares materials needed for the research

Conducts research according to the teacher's instructions

Records the quantity and type of food wasted each day at home and finds the average value in their locality

Records the required data

Draws conclusions at the end of the research

Makes corrections or additions to notes as needed

Discusses the results with the teacher

Teacher's Role: Guides students on how to properly research and analyze the chemical processes occurring at landfills. Prepares students for a visit to a recycling facility and landfill

Activity Description: Students discuss landfills and analyze what from their households and schools ends up in landfills. They can analyze the trash can in their classroom and sort waste into organic and inorganic categories. Older students investigate the chemical processes occurring in landfills, while younger students draw their depiction of a landfill. After the visit, they will redraw the landfill and compare it. Through this process, they become aware of how dangerous landfills are to the environment, natural resources, and health.

Activity 2: How Dangerous Is Food Packaging?

Age Group: 6-14 years

Research Work: Students analyze the amount of packaging waste generated from food purchases.

Class Type: Practical work, workshop, analysis, research

Outcomes: Students develop responsibility for environmental protection and awareness of the amount of waste generated by food packaging.

Student Activities: Formulates a research question and hypothesis: How dangerous is food packaging?

Uses the table they filled out during snack and food waste analysis.

Prepares the materials needed for the research

Conducts research according to the teacher's instructions

Analyzes the packaging associated with the food based on the type of food purchased or produced

Records the data collected

Draws conclusions after the research is completed

Revises or supplements notes if necessary

Discusses results with the teacher

Teacher's Role: Guides students on how to properly conduct research and analyze the impact of food packaging. Facilitates discussions on the environmental impact of packaging

Activity Description: Students examine the amount of packaging waste generated from their food purchases. They will analyze different types of packaging and evaluate their environmental impact. Students use the table they previously completed to compare the quantity and types of packaging waste. They will document their findings and discuss the results, gaining a deeper understanding of how packaging affects waste and environmental health.

Activity 3: Visiting a Landfill / Preparing for the Visit

Age Group: 6-14 years

Research Work: Students prepare for and conduct a field trip to a landfill and recycling center as an outdoor activity.

Type of Lesson: Practical work, workshop, outdoor activity

Outcomes: Students develop responsibility for environmental protection and awareness of the amount of food waste and its management.

Student Activities: Formulate Research Question and Hypothesis: How does a landfill look and function?

Prepare Questions for Landfill Employees: Develop questions to ask employees about landfill operations and waste management. Gather necessary materials for recording observations and data. Follow the teacher's instructions during the visit to the landfill and recycling center. Take notes and collect information about the landfill's operations and waste processes. Analyze the collected data and formulate conclusions about the landfill's impact on the environment. Adjust or expand notes as needed based on observations and findings. Engage in a discussion with the teacher about the visit's findings and their implications for waste management and environmental protection.

Teacher's Role: Help students prepare questions and research materials for the visit. Ensure that the students follow safety protocols and gather relevant information. Lead a discussion after the visit to help students reflect on their observations and understand the environmental impact of landfills. This activity helps students gain practical insights into waste management and the environmental challenges associated with landfills.

Description of the Activity:

Based on previous lessons about landfills and the chemical and physical processes occurring there, students, with the support of their teacher, prepare for the field trip. They take all necessary technical and health precautions, including proper clothing and equipment. Before the visit, students prepare questions and gather paper and notebooks for recording answers and drawing observations. During the visit, they observe, explore, ask questions, and document their findings through notes and sketches. The activity helps students understand the operational aspects of landfills and reinforces their awareness of environmental impacts and waste management.

WORKSHEET 9: COMPOSTING IN NATURE AND OUR GARDEN

Age Group: 6-14 years

Type of Lesson: Practical work, workshop, research, peer collaboration

Background: Students gain knowledge about natural processes of organic matter decomposition.

Outcomes: Students gain insight into natural processes and possibilities for "utilizing" them to reduce the amount of food waste ending up in landfills.

Duration of Activity: Each activity lasts two class periods and can be linked to the outdoor activity "Gardenology," where composting is explored in more depth.

Teaching Materials: Paper, scissors, colored pencils, glue, construction paper, use of computers, creating presentations

Correlations: Nature and Society (the world around us), Biology, Chemistry, Physics, Technical Education, Art, Native Language and Speech Culture

SDG 1 - No Poverty

SDG 2 - Zero Hunger

SDG 3 - Good Health and Well-being

SDG 6 - Clean Water and Sanitation

SDG 11 - Sustainable Cities and Communities

SDG 12 - Responsible Consumption and Production

SDG 13 - Climate Action

SDG 14 - Life Below Water

SDG 15 - Life on Land

SDG 17 - Partnerships for the Goals

Activity 1: How Does Our Garden Compost?

Activity 2: What Is the Relationship Between Our Food and Composting?

Activity 1: How Does Our Garden Compost?

Age Group: 6-14 years

Research Work: Students become familiar with and observe the natural processes of organic material decomposition.

Type of Lesson: Practical work, workshop, research

Outcomes: Students develop a sense of responsibility towards environmental protection, awareness of the amount of food waste, and understanding of natural processes.

Student Activities: Formulate a research question and hypothesis: What is composting? Prepare the necessary tools for conducting the research. Follow the teacher's instructions to conduct the research. Record the required data. Draw conclusions upon completing the research. If necessary, revise or supplement notes. Discuss the results with the teacher.

Teacher's Activities: Directs students on how to observe natural processes in the nearest park or garden, points out the decomposition process, and explains how the process develops.

Activity Description: Students observe natural processes in the schoolyard and discuss their observations, watch video materials that explain the process. They learn that all organic waste, including many food scraps, can be transformed into a new value—compost, which is a highly nutritious substrate for growing plants. This introduces them to another cyclical process in nature, alongside the water cycle, which is the cycle of matter and food. Later, they will be much better equipped to independently initiate a similar process.

Activity 2: What is the connection between our food and composting?

Age Group: 6-14 years

Research Work: Students apply their experience from nature to the garden that is closest to them, whether at school or at home.

Type of Lesson: Practical work, workshop, research, peer collaboration

Outcomes: Students develop a sense of responsibility towards environmental protection and awareness of the amount of discarded and unused food.

Student Activities: Formulate a research question and hypothesis: Can discarded food be composted? Prepare the necessary tools for conducting the research. Follow the teacher's instructions to conduct the research. At home, record the amount and type of discarded food each day. Record the required data. Draw conclusions upon completing the research. If necessary, revise or supplement notes. Discuss the results with the teacher.

Teacher's Activities: Guides students on how to properly think about applying decomposition processes in gardening and food production.

Activity Description: To explore composting possibilities, students need to learn about plant cultivation and constructing raised beds. They first learn about models for creating gardens with minimal mechanical processing, including planting plans, sowing, and planting calendars. They then understand how a raised bed is formed and realize that compost actually helps grow new vegetables, which will, in one or two seasons, close the loop and become compost for future new plants.

WORKSHEET 10: HOW TO MAKE COMPOST AT HOME

Age Group: 6-14 years

Type of Lesson: Practical work, workshop, research, peer collaboration Background: (Starting point): Students gain knowledge about composting rules.

Outcomes: Students gain insight into natural processes and possibilities for "utilizing" them to reduce the amount of food waste ending up in landfills. For this purpose, they learn how to compost at school or at home.

Duration of Activity: The activity has an unlimited duration. One class period is needed to master the initial steps, and one hour per week is required to maintain the compost.

Teaching Materials: Composting area, materials for making a composter, food scraps, old paper, branches, etc.

Correlations: Nature and Society (the world around us), Biology, Chemistry, Physics, Technical Education, Art, Native Language and Speech Culture

SDG 1 - No Poverty

SDG 2 - Zero Hunger

SDG 3 - Good Health and Well-being

SDG 6 - Clean Water and Sanitation

SDG 11 - Sustainable Cities and Communities

SDG 12 - Responsible Consumption and Production

SDG 13 - Climate Action

SDG 14 - Life Below Water

SDG 15 - Life on Land

SDG 17 - Partnerships for the Goals

Activity 1: Food Waste Goes into Compost "Lasagna"

Activity 1: Food Waste Goes into Compost "Lasagna"

Age Group: 6-14 years

Research Work: Students observe how food waste is transformed into compost or a highly nutritious substrate.

Type of Lesson: Practical work, workshop, research, peer collaboration

Outcomes: Students develop a sense of responsibility towards environmental protection and awareness of the amount of discarded and unused food.

Student Activities: Formulate a research question and hypothesis: How does food waste become plant food? Create a composting scheme. Prepare the necessary tools for conducting the research. Follow the teacher's instructions to conduct the research. Collaborate with older and younger students to create composters. Record how the process develops. Draw conclusions upon completing the research. If necessary, revise or supplement notes. Discuss the results with the teacher.

Teacher's Activities: Guide students on how to properly set up the composter, ensure that only permissible food waste and dry materials are added to the composter, and supervise the mixing of compost.

WORKSHEET 11: FOOD WASTE AS A SOURCE OF ENERGY

Age Group: 6-14 years

Type of Lesson: Practical work, workshop, research, peer collaboration

Background: (Starting point): Students gain knowledge about natural processes of organic matter decomposition and energy production processes.

Outcomes: Students gain insight into natural processes and possibilities for "utilizing" them to reduce the amount of food waste ending up in landfills.

Duration of Activity: The activity lasts two class periods for preparation and can be linked to the outdoor activity "Gardenology," where the topic of biogas can also be explored.

Teaching Materials: Paper, scissors, colored pencils, glue, construction paper, use of computers, presentation creation, biogas preparation containers, food scraps

Correlations: Nature and Society (the world around us), Biology, Chemistry, Physics, Technical Education, Art, Native Language and Speech Culture

SDG 1 - No Poverty

SDG 2 - Zero Hunger

SDG 3 - Good Health and Well-being

SDG 6 - Clean Water and Sanitation

SDG 11 - Sustainable Cities and Communities

SDG 12 - Responsible Consumption and Production

SDG 13 - Climate Action

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SDG 15 - Life on Land

SDG 17 - Partnerships for the Goals

Activity 1: How Is Biogas Produced from Plant Waste?

Activity 1: How Is Biogas Produced from Plant Waste?

Age Group: 6-14 years

Research Work: Students have previously explored how to reduce food waste. When waste is inevitably created, it is good to have an idea of how to use it wisely. Since they have learned about gas production in landfills, it is useful to understand how to make these gases beneficial.

Type of Lesson: Practical work, workshop

Outcomes: Students develop a sense of responsibility towards environmental protection and awareness of the amount of discarded and unused food.

Student Activities: Formulate a research question and hypothesis: How does food waste create energy?

Prepare the necessary tools for conducting the research. Follow the teacher's instructions to conduct the research. Collect food waste from home and bring it to school. Prepare the procedure. Draw conclusions upon completing the research. If necessary, revise or supplement notes. Discuss the results with the teacher.

Teacher's Activities: Guide students on how to properly prepare the process of creating biogas from food waste. After comparing the results from both aerobic and anaerobic conditions, students discuss and analyze the differences in biogas and compost production. They reflect on how each process affects the decomposition of organic matter and energy production. This discussion helps them understand the practical applications of their findings and reinforces the importance of managing food waste effectively.

Activity Description: Students bring food waste, plastic containers, a 5-liter bucket, and a vessel from home. Before starting, they study the process. They conduct the biogas and compost creation processes in parallel, comparing how the process occurs under aerobic and anaerobic conditions. The results are compared after 6-10 days.

WORKSHEET 12: HOW DO WATER AND TOPOGRAPHY AFFECT FOOD PRODUCTION?

Age Group: 6-14 years

Type of Lesson: Practical work, workshop, research, peer collaboration

Background: (Starting point): Students gain knowledge about the origin of the species used in our diet, learn to recognize them, and acquire basic knowledge about these species as types.

Outcomes: Students gain insight into how new food in different parts of the world has changed dietary practices, reduced or caused hunger, and how water has influenced this.

Duration of Activity: Depends on the scope of the activities; two activities that can be conducted independently or together.

Teaching Materials: Paper, scissors, colored pencils, glue, construction paper, use of computers, presentation creation, shallow plastic container, sand, water, ruler or triangle, glass, plastic bottle, gravel, charcoal, plants, dry grass and leaves, piece of cotton.

Correlations: Nature and Society (the world around us), Biology, Chemistry, Physics, Technical Education, Art, Native Language and Speech Culture, Geography, History

SDG 1 - No Poverty

SDG 2 - Zero Hunger

SDG 3 - Good Health and Well-being

SDG 6 - Clean Water and Sanitation

SDG 11 - Sustainable Cities and Communities

SDG 12 - Responsible Consumption and Production

SDG 13 - Climate Action

SDG 14 - Life Below Water

SDG 15 - Life on Land

SDG 17 - Partnerships for the Goals

Activity 1: How Does Water Shape the Landscape?

Activity 2: How Does Our Landscape Affect the Water Footprint of Food Production?

Activity 3: How Do Topography and Plant Life Purify Water?

Activity 1: How Does Water Shape the Landscape?

Age Group: 10-14 years

Research Work: Students observe the impact of water on the landscape.

Type of Lesson: Practical work, workshop, review

Outcomes: Students describe the formation of different landforms created by the direct action of water. They differentiate between coastal landforms and provide examples from Europe and the surrounding area.

Student Activities: Form teams. Formulate a research question and hypothesis: How does water shape the landscape? Prepare the materials needed for the experiment. Follow the teacher's instructions to conduct the experiment. Record and describe changes observed during the experiment. Define and describe the process of shaping sand by water. Draw conclusions. Record everything in their notebook. Read the relevant text in the textbook. Work in groups to classify landforms and provide examples. Revise or supplement notes as needed.

Teacher's Activities: Guide students on how to properly conduct the experiment. Monitor and point out any potential errors. Discuss the results with the students.

Activity Description: In a plastic container, place sand in one half and pour water into the other half. The sand level should be higher than the water to observe changes. Use a ruler or triangle to gently tap the water surface to create waves—observe the formation of coastal edges or cliffs. Pour water into a glass and gently pour it over the sand to create canyons (observe how the riverbed expands and the type of mouth that forms). Observe what happens to the sand, identify the process, note where changes are more significant on the shore, and determine which landforms are created.

Activity 2: How Does the Landscape Affect the Water Footprint of Food Production?

Age Group: 6-14 years

Research Work: Students explore food production in different landscape conditions: flatlands, mountainous, and coastal areas.

Type of Lesson: Practical work, workshop, research work, peer collaboration

Outcomes: Students develop responsibility for environmental protection, awareness of food waste, learn about conditions for food production, and recognize the needs of that production.

Student Activities: Form teams. Formulate a research question and hypothesis: How does the landscape affect food production? Research types of landscapes and soil layers and assess their fertility. Draw conclusions about how the landscape impacts food production. Record everything in their notebook. Read the relevant text in the textbook. Work in groups to classify landforms and provide examples. Revise or supplement notes as needed.

Teacher's Activities: Guide students on how to properly conduct their research and which parameters to pay attention to. Assist them in making comparisons and drawing conclusions.

Activity Description: Students are divided into teams and choose different types of landscapes for investigation. Each group researches soil types, water regimes, and soil permeability. They investigate which plants thrive in each type of landscape. Afterward, they identify at least three types of crops that are grown in all types of landscapes. They compare the characteristics of these crops in each landscape type, their cultivation methods, and their water needs. Finally, they calculate the water footprint for each type of landscape individually.

Activity 3: How Do Relief and Plant Life Purify Water?

Age Group: 6-14 years

Research Focus: Students investigate how water is purified in different relief forms and identify the cleanest spring waters. They explore how relief structures and plants contribute to water purification.

Class Type: Practical work, workshop, research, peer activity, field trip

Learning Outcomes: Students develop responsibility for environmental protection. Students become aware of the impact of different relief forms and plant life on water purification.

Student Activities: Formulate Research Question and Hypothesis: How is water purified in nature? How do relief structures and plants affect water purification? Students form teams to explore different aspects of water purification. Investigate types of relief and soil layers through which water flows to a spring. Connect findings with the natural water cycle and filtration processes.

Field Trip to Waterworks: Visit local waterworks or natural springs to observe water purification processes. Determine how different relief features and plant life contribute to water purification. Document observations and conclusions in their notebooks. Read related textbook sections to support their findings. Collaborate to classify relief types and provide examples. Compare how different relief features affect water purification. Make any necessary corrections or additions to their notes.

Teacher's Role: Guide students on how to conduct their research properly. Advise on important parameters to focus on. Assist in comparing results and drawing conclusions. This activity not only helps students understand how natural processes purify water but also engages them in practical research and problem-solving.

Activity Description: Students are divided into teams and select different types of relief for investigation. Each group researches soil types, water regimes, and soil permeability. They explore how filtration occurs. After the research, they create a mini bioreactor for purifying dirty water. They analyze the layers they need to assemble and compare their function to natural processes. The teams conduct water filtration experiments using various materials in different combinations, aiming to achieve a correct sequence and purified water. Additionally, a field trip to a water treatment plant is organized, where students learn about the processes involved in purifying water that is distributed as clean drinking water.

WORKSHEET 13: WATER HAS A TASTE

Age Group: 6-10 years

Type of Lesson: Practical work, workshop

Background (Starting Point): Students gain knowledge about the properties of water.

Outcomes: Students learn about the composition of water, observe the differences between tap water and mineral water, as well as the differences between carbonated and non-carbonated water.

Duration: One class period

Teaching Materials: Paper, scissors, crayons, glue, construction paper, use of computers, creation of a presentation

Correlations: Nature and Society (the world around us), Biology, Chemistry, Art, Native Language and Speech Culture

SDG 1 - No Poverty

SDG 2 - Zero Hunger

SDG 3 - Good Health and Well-being

SDG 6 - Clean Water and Sanitation

SDG 11 - Sustainable Cities and Communities

SDG 12 - Responsible Consumption and Production

SDG 13 - Climate Action

SDG 14 - Life Below Water

SDG 15 - Life on Land

SDG 17 - Partnerships for the Goals

Activity 1: On the Trail of Taste

Activity 1: On the Trail of Taste

Age Group: 6-14 years

Type of Lesson: Practical work, workshop

Research Focus: Students gain knowledge about the composition of water, observe differences between tap water and mineral water, as well as between carbonated and non-carbonated water.

Outcomes: Students develop organoleptic abilities, observe differences between drinking water and other types, and define what the healthiest drink is.

Student Activities: Observe visual differences between different types of water (look for bubbles). Read the composition of the water (label on the packaging), record the mineral composition in a table. Compare the mineral composition of different waters. Taste the water and record the taste in a table. Taste the water and note differences in taste between water in glass and plastic containers. Prepare the necessary materials for the activity.

Materials Needed: Different types of water (tap water, mineral water, carbonated water, non-carbonated water), Glasses or cups, Labels from water bottles, Paper and pencils for recording observations, Tasting sheets or tables for recording data

Teacher's Activities: Preparation of Materials/Samples:

Water Samples: A pitcher of tap water; One non-carbonated mineral water in glass packaging; One non-carbonated mineral water in plastic packaging; Two different types of mineral water of your choice

Additional Materials: Glasses or cups for tasting

Instructions: Prepare the water samples and glasses for tasting. Instruct students on the order in which to taste the water and how to fill out the table. Facilitate a discussion about the activity.

Activity Description: Tasting various types of water is always a fun activity. Students will experience a "real" tasting session where they try different waters and record their impressions in a table, either as ratings or descriptions. After tasting, students will discuss and analyze their observations. This helps them understand differences in taste and quality between different types of water and packaging.

WORKSHEET 14: WATER FROM WASTE FOOD

Age Group: 6-14 years

Type of Lesson: Practical work, workshop, research, peer collaboration

Background (Starting Point): Students gain knowledge about natural processes involved in the decomposition of organic matter.

Outcomes: Students understand natural processes and explore ways to "use" them to reduce the amount of food waste that ends up in landfills. In addition to compost, biogas, and organic waste, excess water created can be useful for plants.

Duration: Preparation takes two class periods, with additional time needed for the process to complete.

Teaching Materials: Paper, scissors, crayons, glue, construction paper, use of computers, creation of presentation, 4 plastic containers, organic waste, and inorganic waste.

Correlations: Nature and Society (the world around us), Biology, Chemistry, Physics, Technical Education, Art, Native Language and Speech Culture

SDG 1 - No Poverty

SDG 2 - Zero Hunger

SDG 3 - Good Health and Well-being

SDG 6 - Clean Water and Sanitation

SDG 11 - Sustainable Cities and Communities

SDG 12 - Responsible Consumption and Production

SDG 13 - Climate Action

SDG 14 - Life Below Water

SDG 15 - Life on Land

SDG 17 - Partnerships for the Goals

Activity 1: Separating "Compost Water"

Activity 1: Separating "Compost Water"

Age Group: 6-14 years

Research Focus: Based on acquired knowledge about the decomposition of organic matter, students explore new ways to use food waste as a resource.

Type of Lesson: Practical work, workshop

Outcomes: Students gain insight into natural processes and explore how to "use" them to reduce the amount of food waste that ends up in landfills. In addition to compost and biogas, organic waste creates excess water that is beneficial for plants.

Student Activities: Organize into small groups for collaborative work. Research Question and Hypothesis: Develop a research question and hypothesis, such as "Is the water useful?" Carry out the experiment with the help of the teacher. Set up a control experiment with less organic waste and more non-decomposable waste. Analyze how organic matter decomposes and what happens with inorganic matter. Write all observations and results in a notebook. Discuss findings and insights with the group. Observe the compost water under a microscope and use it to water their small gardens. Make any necessary corrections or additions to notes based on observations and discussions.

Teacher's Activities: Preparation of Materials/Samples: Assist students during the experiment, providing guidance after initial instructions. Direct students on how to analyze the situation. Facilitate discussions and help determine the composition of the compost water.

Activity Description: Prepare Waste Samples: Place prepared organic, biodegradable waste and non-degradable waste into containers. A 5-liter canister is sufficient. One container is filled exclusively with organic waste. The other container is a combination of organic and non-degradable waste. Create small holes at the bottom of each container to allow water to drain. Place containers underneath to collect the water.

WORKSHEET 15: VIRTUAL WATER

Age Group: 6-14 years

Type of Lesson: Practical work, workshop, research, peer collaboration

Background (Starting Point): Students gain knowledge about the natural processes of decomposing organic matter.

Outcomes: Students understand natural processes and explore ways to use this knowledge to reduce food waste ending up in landfills.

Duration: Each activity lasts two class periods and can be linked with outdoor activities such as "Gardenology" where composting is explored in greater depth.

Teaching Materials: Paper, scissors, crayons, glue, construction paper, use of computers, creation of presentations.

Correlations: Nature and Society (the world around us), Biology, Chemistry, Physics, Technical Education, Art, Native Language and Speech Culture, Informatics

SDG 1 - No Poverty

SDG 2 - Zero Hunger

SDG 3 - Good Health and Well-being

SDG 6 - Clean Water and Sanitation

SDG 11 - Sustainable Cities and Communities

SDG 12 - Responsible Consumption and Production

SDG 13 - Climate Action

SDG 14 - Life Below Water

SDG 15 - Life on Land

SDG 17 - Partnerships for the Goals

Activity 1: What is Virtual Water?

Activity 2: Planning a Healthy Meal and Considering the Water in Your Body

Activity 1: What is Virtual Water?

Age Group: 6-14 years

Research Focus: Students explore the concept and values of virtual water.

Type of Lesson: Practical work, workshop, research, peer collaboration

Outcomes: Students develop responsibility towards environmental protection, awareness of food waste, and the consumption of natural resources.

Student Activities: Research Question and Hypothesis: Formulate a research question and hypothesis, such as "What is virtual water?" Review internet links and videos that explain the concept of virtual water. List the foods they plan to use in meals and the amount of virtual water associated with each. Gather necessary materials for the research. Follow instructions from the teacher to carry out the research. Document the required data in an organized manner. Analyze and summarize findings after completing the research. Make any necessary corrections or additions to notes based on the research. Engage in a discussion with the teacher about the results and insights gained from the activity.

Teacher's Activities: Instruct students on how to accurately complete the table and gather necessary data. Lead discussions with students after obtaining results, focusing on raising awareness about food waste and water consumption. Highlight the impact of food waste and how rational meal planning and alternative production methods can reduce virtual water usage. Share web resources and materials to enhance understanding.

Activity Description: Older students: Explore the concept of virtual water by studying the following websites: The Water We Eat, Water Footprint Network. Students will gather information from these sites and discuss the concept of virtual water. They will learn how to apply this knowledge to their meal planning and understand the impact of water consumption in food production.

Younger Students: Watch an animated film about virtual water and create a table to track their water usage over one day. This will help them grasp the concept in a more relatable manner.

Supplementary Materials: Animated film or other relevant videos. Access to educational websites. For recording water usage and understanding concepts.

Activity 2: Planning a Healthy Meal and Considering the Water in Your Body

Age Group: 6-10 years

Research Focus: Students plan a healthy and sustainable meal through the lens of virtual water.

Type of Lesson: Practical work, workshop

Outcomes: Students develop responsibility towards environmental protection, awareness of food waste, and the consumption of natural resources.

Student Activities: Formulate a research question and hypothesis, such as "How much water do we 'consume' with our food?" List the foods they plan to use in their meals and the amount of virtual water associated with each. Gather necessary materials for the research. Follow instructions from the teacher to carry out the research. Document the required data in an organized manner. Analyze and summarize findings after completing the research. Make any necessary corrections or additions to notes based on the research. Engage in a discussion with the teacher about the results and insights gained from the activity.

Teacher's Activities: Instruct students on how to accurately complete their tables for tracking virtual water. Lead a discussion with students after they have obtained their results. Focus on raising awareness about the environmental impact of food waste and water consumption. Emphasize how planning meals with virtual water in mind can lead to more sustainable choices. Explain how rational meal planning can minimize the amount of virtual water used. Encourage students to think critically about their food choices and their impact on natural resources.

Activity Description: Introduction to Virtual Water: After explaining the concept of virtual water and its scope, students will design their "ideal" meal, considering the virtual water content of the ingredients. Students will carefully select ingredients to create the most sustainable meal possible, factoring in the virtual water cost of each item. Students will reflect on how their meal choices impact water consumption and sustainability.

WORKSHEET 16: CONNECTING WORKSHEETS – WHERE IS ALL THE WATER LINKED TO FOOD

Age Group: 6-14 years

Type of Lesson: Practical work, workshop, research, peer collaboration

Background: Students gain knowledge about natural processes related to water, food, and the environment.

Outcomes: Students understand the connection between natural processes and how they can be utilized to reduce food waste, conserve natural resources, and support the economy.

Duration: The number of classes required will depend on the teacher's assessment and how the worksheets are combined.

Teaching Materials: Based on selected worksheets.

Correlations: Nature and Society (Our World), Biology, Chemistry, Physics, Technical Education, Art, Language and Speech Culture, Informatics, Geography, History

SDG 1 – No Poverty

SDG 2 – Zero Hunger

SDG 3 – Good Health and Well-being

SDG 6 – Clean Water and Sanitation

SDG 11 – Sustainable Cities and Communities

SDG 12 – Responsible Consumption and Production

SDG 13 – Climate Action

SDG 14 – Life Below Water

SDG 15 – Life on Land

SDG 17 – Partnerships for the Goals

Activity 1: Connecting Worksheets on Virtual Water

Activity 1: Connecting Worksheets on Virtual Water

Age Group: 6-14 years

Research Focus: Students plan a healthy and sustainable meal considering virtual water, from food production to waste management.

Lesson Type: Practical work, workshop, research

Outcomes: Students develop responsibility for environmental protection, awareness about food waste, and natural resource consumption.

Teacher's Activities: Direct students on how to follow the topic of virtual water through various subtopics and areas. Emphasize how rational meal planning can reduce virtual water consumption and improve sustainability.

Student Activities: Formulate Research Question: Pose the research question and hypothesis: "Where does the story of virtual water begin?" Develop a table listing the foods they want to use in meals and the corresponding amounts of virtual water. Gather the necessary materials for conducting the research. Follow the teacher's instructions to carry out the research. Document the data collected during the research. Analyze the findings and draw conclusions about the use of virtual water in meal planning. Make any necessary corrections or additions to their notes. Engage in a discussion with the teacher about the results and what they learned. For recording virtual water data. Needed for conducting the investigation. For reflecting on the findings and implications.

Activity Description: First, start by introducing the concept of virtual water (worksheet 15). Explore links and video materials. Conclude that the concept of virtual water appears in food production. This connects with the worksheet "From Field to Table" (worksheet 3) and worksheet 12, activity 2: how does our terrain affect the water footprint of our food? Then move on to worksheet 5: What is the content of our refrigerator and plates? After that, link worksheets that address the treatment of discarded food: What do we do with food we haven't eaten? (worksheet 7), Is a landfill a good place for discarded food? (worksheet 9). Finally, you can return to worksheet 15: Virtual Water and draw a conclusion.

WORKSHEET 17: EXAMPLE OF LESSON PREPARATION USING WORKSHEETS

Age Group: 6-14 years

Lesson Type: Practical work, workshop, research, peer collaboration

Background (Starting Point): Students gain knowledge about excessive consumption and the impact of advertising and marketing.

SDG 1 – No Poverty

SDG 2 – Zero Hunger

SDG 3 – Good Health and Well-being

SDG 6 – Clean Water and Sanitation

SDG 11 – Sustainable Cities and Communities

SDG 12 – Responsible Consumption and Production

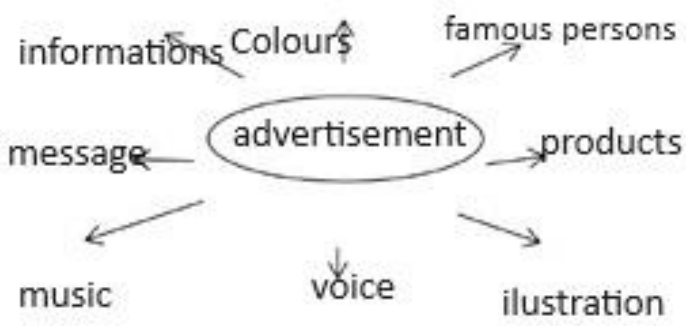
SDG 13 – Climate Action

SDG 14 – Life Below Water

SDG 15 – Life on Land

SDG 17 – Partnerships for the Goals

Workshop		**Ads Tell Us / Worksheet 5: Activity 3: What Attracted Me in the Food Advertisment?**
Topic		Processes in the Modern World - Excessive Consumption
Outcome:	Students will be able to:	Recognize media messages that encourage excessive consumption.
Lesson type		workshop
Teaching Methods		Dialogic, illustrative, demonstrative
Forms of Work		Frontal, individual, group work
Teaching Aids:		Notebook, manual, worksheets with questions for work
Student Activities:		Play, collaborate and negotiate in groups, come up with ideas together, divide tasks, and show tolerance
Teacher Activities:		Leads the game, discussion, divides into groups, assists, encourages
Correlation:		Native language, nature and society, visual arts, music education
number	**activity**	**description**

1.	Introduction Activity:	The teacher asks students if they have watched the ads as agreed. What comes to mind when they think about ads? What attracts their attention the most? The teacher records their answers in a schematic form. 
2.	Watching and Analyzing Advertismentss:	Juice Advertisment: Do you like the ad? Why? Why is the ad full of bright colors, music, and play? Does the ad mention that we shouldn't drink juice every day, that juices are not considered healthy food? Why is this omitted? Cream Advertisment: Do you like the ad? Why? What does "The nuttiest flavor ever" mean? What is the message behind the slogan: "Nothing is better than a little bit of enjoyment"? Does the ad mention cavities and rotten teeth? Do you ever find yourself wanting what you see in an ad? What is it most often? Have you ever bought something that went bad or wasn't as tasty as you thought? Have you ever bought something you didn't need, just because of the ad?
3.	Individual work: Pair Work:	Students write a title: What Attracted Me in the Food Ad? List their favorite ads. In pairs, they create an ad for a product of their choice in their notebook. They should present it in the best possible way! They can use exaggerated words – best, healthy, completely natural...
4.	Presentation of Work:	Pairs who wish to present their ads and discuss what they omitted, exaggerated, or honestly portrayed in their ads.
5.	Final Activity - Exhibition:	Students display their work in a designated area in the classroom, hallway, or school lobby.

WORKSHEET 18: INTRODUCTORY SURVEY SHEET

Google form

WORKSHEET 19: EVALUATION SHEET

Google form

WORKSHEETS 20: ATTACHMENTS

https://drive.google.com/drive/u/1/folders/1EIWIISUYBMHdRikPodnIol_51zqu4MVK

C. RECOMMENDATIONS FOR OUTDOOR TEACHING

APPENDIX 1 - WATER DAY

Water Day is a full-day activity held at the end of the school year. It is dedicated to celebrating water, an essential life resource, reminding us of its presence in various aspects of our lives. Students and visitors recognize the importance of water for the development of their community, for nature, and for the organism. Students present their water-related learning activities to other students and invited members of the local community.

Water Day can be held in the schoolyard, around the school, or ideally by a body of water. During Water Day, you can conduct activities that are not possible in the classroom. We empower students to manage water sustainably, both now and in the future. Water Day is an interdisciplinary activity in which the entire school can participate, learn about the importance of water, sustainable management of it, and have fun in the process.

During Water Day, various activities take place simultaneously, so we prepare them in different spaces and setups, such as tables and stands arranged over a larger area. At each location, a group of students presents their water exercise and explains it to visitors. This setup allows for movement and makes the activities more engaging. In addition to students and teachers, we invite local experts who work with water, such as municipal authorities, environmental protection agencies, and staff from nature parks, to showcase their work related to water and highlight the importance of water to the students.

EXAMPLES OF ACTIVITIES FOR WATER DAY

1. **Determining the Amount of Sugar in Beverages** (SDG 3: Good Health and Well-being)

This activity allows for several variations that you can develop on your own. Here, we will explore two.

a) Determining the Amount of Sugar in Beverages Using a Nutritional Traffic Light

Objective: Students learn that beverages contain a lot of hidden sugar, which can lead to increased body weight, and that the best drink is water or unsweetened tea.

Activity Preparation: In our student corner, we set up a table with three circles: red, orange, and green. Each circle represents the amount of sugar in the beverage: red for more than 6.3g/100ml, orange for 2.5-6.3g/100ml, and green for less than 2.5g/100ml. Students bring a beverage packaging that they or their family members consume. They check the sugar content on the label and place it in the corresponding circle. This allows them to see how much sugar is in their beverages. (More at: veskajjes.si)

Activity Flow: On Water Day, students and visitors check their beverages on the traffic light to see where their drink falls.

Materials Needed: Green, red, and orange markers, scissors, beverage bottles for students and their family members.

b) Determining the Amount of Sugar in Beverages and Comparing Beverages

Objective: Students learn that beverages contain a lot of hidden sugar, which can contribute to increased body weight, and that the best drink is water or unsweetened tea.

Activity Preparation: Read the amount of sugar in each beverage from its packaging. Prepare sugar packets to match the amount of sugar listed on the packaging. Attach empty beverage containers to a poster and place the corresponding number of sugar packets under each container. This visual setup allows for a straightforward comparison of sugar content among different beverages. You can also draw red, orange, or yellow circles on the poster to indicate that some beverages have too much sugar, some have medium levels, and others are acceptable. Display the poster in a prominent location in the school, such as the cafeteria or hallway.

Activity Flow: On Water Day, visitors and students use the poster to see how much sugar is in their favorite beverages.

Materials Needed: Numerous 5g sugar packets, a poster, empty beverage containers from students and their family members.

2. How Much Water is in Food? (SDG 15)

Objective: Water is present in all food items; without water, there is no life.

Activity Preparation: Prepare slips of paper with a photograph of a food item on one side and the percentage of water it contains on the other side. The slips can be laminated to make them more durable. You can also bring actual food items and place them next to the slips.

Activity Flow: On Water Day, students and visitors guess how much water each food item contains.

Materials Needed: Photographs of different food items, markers, a laminating machine (for the slips), and various food items.

3. **Microscopy of Pond Water – Life in a Drop of Water** (SDG 14)

Objective: Students observe life forms from various water samples and identify what they see.

Activity Preparation: In this section, students bring pond water in containers and can create small puddles. Prepare microscopes for the activity.

Activity Flow: Students prepare three samples for observation on three microscopes. They use a pipette to place a drop of water on a microscope slide, cover it with a coverslip, and observe the life in the water drop under the microscope. Participants of Water Day also observe samples from different water sources under the microscope. They can view various single-celled organisms such as filamentous algae (chlorophyll), paramecia, and others.

Materials Needed: Water from a nearby pond or swamp, microscopes, microscope slides, and coverslips.

4. **Creating Literary Water Drops and Water Candies in Language Arts Classes** (SDG 6, 12, 15)

Objective: Water is an important part of human culture. Due to its significance, pleasure, and mystery, water has always inspired human imagination and creativity, being associated with many rivers, literary works, and legends.

Activity Preparation: During the language arts class, students explore how water appears in poetry, literature, and legends. They search for interesting rivers, proverbs about water, poetry, prose, and legends. Students write their favorite quotes, verses, excerpts, or proverbs on paper no wider than 10 cm x 10 cm or on larger paper shaped like a drop, at least A5 in size. They roll the paper and tie it with straw twine (creating water candies instead of real ones) or write the text on larger, literary water drops.

Materials Needed: Paper (for quotes, verses, etc.), straw twine, pens or markers, and optionally, templates for shaping paper into larger water drops.

Activity Flow: Students bring their literary water drops to their designated area and hang them on a visible string along with the water candies they created during their Slovenian language class.

The water candies are placed in glass jars or containers. Visitors are offered water candies with verses or proverbs about water to take home. Student visitors read the literary water drops hanging in the corner and are invited to write their own water drop. During Water Day, together with visitors, a river of beautiful thoughts about water is created, which is displayed for everyone to see.

Materials Needed: White, light green, and light blue A4 paper. Smaller dark blue and green sheets for making 10 cm x 10 cm paper pieces for water candies. A5-sized water drop cutouts. Markers for visitors to write on their water drops. String or twine to hang the water drops and candies.

5. Creating Water-Themed Artworks in Art Class (SDG 6, 7, 8, 9, 10, 11, 12, 13, 14, 15)

Objective: To highlight the significance of water in human life and raise awareness of its diverse presence through artistic expression.

Preparation: Students will reflect on critical water-related issues and everyday themes they wish to explore through art. They will select an artistic technique to use for their creations.

Artistic Creation: Students will create artworks based on various water-related themes, such as: Life in water, Water pollution,Water in food,Leisure and recreational activities involving water

Materials: Provide students with diverse art materials, including: Paper, Colored pencils, Tempera and acrylic paints, Clay, Drawing tools, Linocuts or printmaking materials

Activity Flow: Students create their artworks during art class, focusing on their chosen themes and using their selected techniques.

Display: Decorate the space where Water Day is celebrated with the students' artworks.

Optionally, organize an exhibition to showcase the students’ creations within the school, celebrating their artistic expressions related to water.

6. Measuring Water pH (SDG 6, 13, 14, 15)

Objective: To determine the pH of water from various local sources (rivers, streams, tap water) and understand the implications of these results on pollution, aquatic life, environmental impact, and water safety.

Preparation: Students collect water samples from different local sources such as rivers, streams, and tap water.

Materials: Prepare pH test strips or litmus paper. Gather necessary equipment for testing pH levels.

Preliminary Discussion: Prior to the activity, discuss with students the concept of pH and what the results indicate regarding water quality, pollution, and its impact on the environment and human health.

Activity Flow: Students prepare three or more containers with water samples from different sources.Using the litmus paper or pH test strips, students measure the pH of each water sample.

Explanation: Students explain the pH levels of the water samples to visitors. They discuss what the results mean in terms of water quality, pollution, and safety for drinking.

Discussion: After testing, students and visitors review the pH results together. Discuss the implications of the pH levels on the environment, aquatic life, and human health.

7. Water Filtration (SDG 6)

Objective: To demonstrate how water treatment facilities work and to show that it is possible to purify water to some extent using basic materials.

Materials: Collect charcoal, sand, gravel (both fine and coarse), straw, and plastic bottles.

Cut the plastic bottles approximately one-third from the top. The smaller part with the neck should be inverted and placed inside the larger part of the bottle.

Setup: Prepare the filtration materials and discuss the experiment with students.

Activity Flow: Instruct students to layer the filtration materials in the top part of the bottle in the following order: gravel at the bottom, followed by coarse sand, fine sand, charcoal, and finally straw.The smaller inverted bottle is placed inside the larger bottle to act as the filter. Students pour dirty water into the filter bottles and observe the filtration process. Discuss with visitors and students how each layer contributes to the filtration process and how the water becomes cleaner as it passes through the materials. Students explain to visitors what is happening during the filtration process and the role of each material in filtering out impurities.

This activity provides a hands-on experience in understanding water filtration and emphasizes the importance of clean water for health and sustainability.

8. Review of Water Treatment Company (SDG 6, 11, 12, 13)

Objective: To show students where tap water comes from and understand the process of water purification.

Preparation: Coordinate with Water Supply Authority, Arrange a guided tour of the water intake facilities with the local water utility. Students visit the water intake facilities with the water utility staff. During the tour, students learn about the water source, the function of the intake structure, and the purification process. Back at school, students create a poster based on their observations during the visit. The poster should include information about the water intake process, purification methods, and any other relevant details learned during the tour. Display the poster in a visible area at school to share their findings with the broader school community.

Materials Needed: Sports shoes (for the field visit), Poster board, Markers, Pictures related to water for decoration on the poster

9. Virtual Water (SDG 3, 6, 11, 12, 13)

Objective: To raise awareness among students about the amount of "invisible" water used in the production of various products and encourage them to be more mindful and economical in their choices.

Preparation: Discuss the concept of virtual water with the students. Virtual water refers to the amount of water used in the production of goods and services, which is not directly visible. Collect images or actual products and their corresponding virtual water usage statistics. Prepare a poster about virtual water, including information and infographics, such as the one from “Water we eat.” Set up a corner in the classroom with the poster and the products or images.

Activity Flow: Explain to students the concept of virtual water and how it relates to everyday products. Set up the poster and display the products or their images. Invite students and visitors to guess the amount of water used in producing each product. Provide information on virtual water usage for each product and discuss how this impacts water resources.

Materials Needed: Poster about virtual water, Paper and markers for notes and observations

10. Water Conservation – Finding the Best Idea; We Have the Best Quiz (SDG 3, 6, 11, 12, 13)

Objective: To raise awareness among students about the importance of water conservation and encourage them to implement practical ideas for saving water.

Preparation: a. Discuss with students and the teacher about various ways to conserve water. Consider activities that use the most water and strategies to reduce consumption. Prepare a list of facts about water usage, including where the most water is used (e.g., in washing, toilets, long showers) and simple actions to reduce water consumption.

b. Create a Fun Quiz: Design a quiz related to water usage and conservation. Include questions such as: Where do we use the most water: when brushing teeth, flushing toilets, or taking long showers? What are some simple actions to save water in daily household tasks? Prepare the quiz to be engaging and informative, possibly with multiple-choice questions or true/false statements.

Activity Flow: Display facts about water consumption near relevant places like toilets and faucets. Invite visitors to come up with innovative ideas for reducing water usage and post these ideas in a visible spot. Water Conservation Quiz: Set up the quiz station with posters and materials. Encourage participants to form teams to make the quiz more engaging and fun. Offer a small prize, such as a visit to a local pool or another fun reward, for the team with the highest score.

Materials Needed: Poster with water conservation facts, Markers and paper for brainstorming ideas, Quiz questions and answer sheets, A prize for the quiz winners

11. Water Cocktails (SDG 3, 6, 12, 13)

Objective: To encourage students to drink more water by demonstrating how it can be enhanced with natural flavors and showing the benefits of drinking water and herbal infusions.

Preparation: Review different recipes for water infusions and cocktails. Select those that are appealing and feasible. Visit the school's organic garden to select appropriate herbs and fruits for the recipes. Discuss with students the positive effects of drinking water on the body. Talk about the benefits of various herbs (e.g., mint, lemon balm, lavender, oregano, rosemary, bay leaf) and how they can enhance water flavor and provide additional health benefits. Experiment with different flavor combinations using herbs and fruits. Consider adding ingredients like pickles for a unique twist. Have students vote on their favorite combinations and finalize the recipes for Water Day.

Activity Flow: On Water Day, students prepare the water cocktails for visitors based on the selected recipes. Provide explanations to visitors about the ingredients used and their health benefits. Emphasize the importance of drinking water and the positive impact of flavored water. Students serve the water cocktails in glasses. Engage with visitors by explaining how different herbs and fruits affect the taste and health benefits of water. Encourage visitors to try different flavors and provide feedback.

Materials Needed: Glasses for serving, Fresh herbs and fruits (e.g., mint, lemon balm, lavender, rosemary, fruits), Pickles (optional, for unique flavor combinations), Utensils for preparing and serving, Enthusiastic and friendly students for serving and interacting with visitors

Appendix 2: GARDENOLOGY

Objective: To train school-aged children in growing vegetables independently in various conditions, collecting plant seeds, organizing a garden, planning plant planting, making seedlings, monitoring development, obtaining the final product, and also covering topics related to proper nutrition.

Implementation: Considering that gardening is a long-term process that requires attention to various plant needs and weather conditions, planning at the school year level is essential. With certain adaptations, some segments can also be organized as one-day activities.

Outdoor Activities: Engaging in horticulture activities allows students to be outside, in contact with the soil and plants, generally interacting with nature, and performing manual tasks, which affects their motor skills and coordination.

METHOD AND PREPARATION OF THE GARDEN:

1.Creating Raised Beds and Using Nutrient-Rich Substrate: Often, the conditions for growing vegetables in school yards are insufficient, primarily in terms of soil quality, sunlight, and maintenance of order and cleanliness. To effectively implement this process, we create raised beds filled with nutrient-rich substrate. The entire process functions without the need for digging.

2. Seedling Production in-House: We advocate for in-house seedling production (in pots in the classrooms). To make sustainability more visible, we do not purchase new planting containers but instead use tetrapaks from yogurt and milk, as well as egg cartons, which we even decompose through production.

3. Use of Recycled Materials for Planting: It is very important for us that children learn about composting as it closes the loop of returning what we have taken from nature. Collaborating with the school kitchen is crucial, as it provides us with materials for composting.

4. Importance of Composting for Maintaining Soil Quality: To preserve and improve soil quality and fertility year after year within the sustainable horticulture program, we use several techniques. First, we avoid, or have eliminated, digging, plowing, or any form of mechanical intervention in the soil. We consider that the school has a kitchen, and in collaboration with it, we can collect food preparation waste (peels and other raw vegetable and fruit scraps). Additionally, students can bring food leftovers from home.

5. Techniques of Sustainable Gardening in School Gardens: Using the so-called “no dig method,” the only processing involves lightly aerating the surface layer of the soil and constant addition of layers of compost or mulching, which is composted on-site.

Activity 1: Gardening is a Big Experiment

Objective: To introduce children to the basic stages of the process of setting up a garden for growing vegetables and flowers – how and where we grow vegetables.

Activity Description: Classes take place in the school’s outdoor space. The session begins with a small survey where each child shares which vegetables they know, which they like the most, and why. We

discuss the parts of vegetables, what parts we eat, and what happens with the other parts of certain types. We also talk about annual and biennial plants. The children are tasked with drawing their favorite types of vegetables, which will later be used for the planting calendar and planting scheme. We start discussing the planting calendar and crop rotation. They can also suggest designs for the garden and the planting calendar scheme. At the beginning, we focus on the technical aspects of garden design. Therefore, we touch upon composting, which the children are familiar with from previous workshops, and we connect and explain in more detail why we compost the garden.

Technical Details: To start engaging in horticulture, we must first ensure the physical conditions by creating garden beds and compost bins.

Creating Garden Beds: Use pallets, old crates, tables, or benches. Optimal dimensions for the garden bed are 1.2 m x 2.0 m x 0.4 m (optionally 1.0 m x 2.0 m x 0.5 m). For lining the interior, we can use cardboard, burlap sacks, sheets, or plastic. It is important to line and prevent the loss of substrate and water. If conditions do not allow each class to have its own garden bed, we will create a plan for joint work on one garden bed, with each class working at a designated time.

Creating Compost Bins: If technical conditions permit, it would be beneficial to create a complete set of compost bins. For this, we can also use pallets, specifically 7 pallets (3 for the back panel and 4 for the dividers, creating 3 compartments for three stages of composting). We take into account that the school has a kitchen, and in collaboration with it, we could collect food preparation waste or bring scraps from home (peels and other raw vegetable and fruit scraps).

Activity 2: Gardening Plan

Objective: To familiarize children with the natural process of vegetable growth – how vegetables grow.

Activity Description: Create a scheme for planning planting. Before that, we explain to students the stages of vegetable development from seed to plant at the table. Students get acquainted with the process of plant growth and development, as well as the conditions necessary for their growth. They start with planting the first crops. Students are tasked with creating a planting calendar, drawing the types of vegetables they will place in the garden sketch, and drawing the garden sketch itself. Each class creates one sketch, or within a single section, sketches for multiple garden beds are made. The plan should include a wide variety of vegetables; some types will be represented in multiple garden beds, while others will be present only in some, thus creating a very diverse selection of vegetables through alternating combinations.

Activity 3: From Seed to Fruit – A Colorful Journey

Objective: To familiarize children with the process of planting vegetables from seed to transplantable plant.

Activity Description: Preparation for planting in classrooms. Heat and ample light contribute to the healthy development of seedlings. As the idea of horticulture is essentially sustainable gardening, our focus is on minimizing waste and using all possible makeshift resources and recyclable materials. Students have collected recyclable tetrapak containers (milk and yogurt cartons, cups from dairy products, and sturdy plastic bags) for planting. We have already collected and sorted seeds according to the time and place of planting. Some vegetable types are first germinated and then placed into planting

containers, while others are directly sown into containers. By monitoring temperature and humidity, we emphasize the importance of these conditions for seed germination to the students.

Activity 4: You Don't Have to Be That Good at Gardening, But Gardening is Good for You

Objective: To raise students' awareness about the importance of healthy eating and gardening – why we grow and eat vegetables.

Activity Description: As the cold weather approaches and vegetation enters a dormant phase, this will also occur in the garden beds. Depending on the expected conditions, we will focus on additional plant care, including mulching or covering (we will specifically explain the process and reasons), and protecting the garden beds from frost.

Activity 5: Our Garden Grows as Our Imagination Does

Objective: To familiarize children with the process of transplanting and planting vegetables in garden beds.

Activity Description: As warm spring days approach, the chances of our garden beds getting occupants increase. At the end of February, we first assess the condition of our plants sown in the fall, which are now beginning to look like mature plants. Additionally, we can transfer seedlings that we previously grew from communal sowing in containers into individual pots. We work with varieties that can tolerate still-cold and variable weather, but which can be our first results for harvesting and preparing early salads. We also explain why some types require transplanting while others are sown directly into the soil. Students' tasks include following the planting calendar and taking care of the next steps. They should also represent the composting process in drawings or create a story about, for example, an earthworm living in compost. We return to the topic of composting and discuss the importance of the process. If technical conditions allow and we have compost bins, we may be at a stage where we can observe the differences or stages of waste decomposition and transformation into compost. We will cover our garden beds with fresh compost, especially areas where we plan to plant and sow, but compost can also be used for mulching.

Activity 6: We Build the Garden, the Garden Builds Us

Objective: To familiarize children with the process of maintaining garden vitality and our health

Activity Description: Start planting outdoors for varieties that can tolerate potentially low temperatures and for which we can expect fruit quickly. We delve further into the topic of gardening. We discuss insects as pollinators and their importance. We also cover methods of protecting plants in ways that do not harm us or the insects. Anticipating the appearance of "weeds," we will explore their characteristics and potential use in food. Children are tasked with creating a "weed map" of those encountered in gardening and drawing the development cycle from flower to vegetable fruit with the help of pollinators.

Activity 7: Nature in Play

Objective: To familiarize children with the process of crop rotation or changing plant types.

Activity Description: It is time for the first crop rotations in the gardens. We have covered this through creating a planting calendar. Now, we apply it in the garden. Depending on the type, we either sow new plants directly or transplant previously grown seedlings. We combine flowers and herbs, making our

garden truly diverse. This results in a new amount of waste that we compost, as well as the first fruits we can consume. As the break approaches, we need to think about maintaining the garden beds during the summer. How to water, how to harvest the fruits? For plants that are already producing leaves and fruits, we will also begin selecting materials for creating a herbarium.

Activity 8: May Has Arrived, Our Garden is Paradise

Objective: To familiarize students with the process of caring for vegetables and the coexistence of different plants and animals with our vegetables.

Activity Description: Crop rotation becomes more intensive, as does the care of planted plants. With certain types, we need to perform interventions (such as staking, tying, pruning vines, and pinching off suckers). We are increasingly aware of the plants' need for water and nutrients, so we address these topics. Additionally, as nature has fully awakened, we become aware that our vegetables are developing through the shared life and activities of other living beings. We continue collecting materials for the herbarium.

Activity 9: From Seed to Salad – Garden Party

Objective: To familiarize children with the principle of garden self-sustainability.

Activity Description: Discuss with students about maintaining the garden during the summer while they are on break. This is also the time when we can harvest the first substantial quantities of produce and prepare colorful salads and juices to mark the end of the school year. We will invite parents to join us for this celebration.

Appendix 3 - A DAY AT THE EDUCATIONAL FARM

Activity 1: Olive Harvesting

Age Group: 6-14 years

Field Trip: Olive Harvesting

Type of Lessons: Exploratory, Combined

Duration: 6 Lessons

Student Activities: Olive harvesting competition, Drawing label design proposals

Activity Description: Going to the school olive grove according to a prearranged schedule. Distributing tools to students for olive picking (hand rakes and nets placed under the olive trees to catch the harvested olives). Identifying native olive varieties (Oblica, Bijelica, Buža). Collecting olives and properly storing them in plastic crates. Learning about traditional and modern olive harvesting methods. Transporting olives for processing and producing olive oil. Drawing on the theme of olives, Vodnjan, and the local area in general. Selecting the best works for processing and printing, creating labels and declarations, preparing and bottling the finished olive oil. Labeling the bottles, daily use and consumption of school olive oil in the school kitchen. Exhibiting and selling at the "Days of Young Olive Oil" event, presentation and sale of products for visitors at the traditional Christmas school performance.

Additional outdoor activities can be included as well.

Activity 2: Creating Insect Hotels

Student Activities: Building an insect hotel and learning interesting facts about solitary bees and their importance as pollinators.

Activity Description: Search the schoolyard for various natural materials such as wooden planks, straw, old and discarded bricks, pebbles, and other similar materials. Collect discarded items from home made of natural materials, which can also be used. Create a wooden structure of any shape, but it is most commonly built in the shape of a small house (using old pallets or planks). Secure the structure into the ground. Install horizontal shelves to serve as different levels of the hotel (shelves are not necessary if the hotel is small). The lowest shelf should be elevated a few centimeters from the ground; place a couple of old planks or pieces of wood underneath this level to accommodate insects that live in the soil. Fill the spaces within the structure with a variety of hollow materials where insects can hide: old bricks with holes, broken brick fragments, wooden blocks with holes of different diameters, reed, sunflower, and bamboo branches with hollow stems, straw and leaves, tree bark and small wooden blocks, sheep wool, ropes, and plant pots. The more diverse the materials, the more types of insects will find a new home in the hotel. Build a roof from a sturdy material, preferably slanted to allow rain to slide off. Position the hotel in an ideal spot in the garden – preferably an open area (not where many plants are growing or

near large bushes). Ensure the location is not very windy, and avoid placing it in a wet and damp area to prevent it from becoming uninhabited. Wait a few weeks for the new inhabitants to start settling in. Observe and monitor the insect hotel to evaluate its effectiveness and the variety of insects it attracts.

Activity 3: Construction of a Pond (Artificial Water Reservoir)

Activity Description: Climate change is causing a decline in biodiversity in freshwater habitats, such as wetlands and other moist environments. Wetlands and moist habitats are rapidly disappearing, leaving ponds as the remaining refuges where this biodiversity can be preserved. Ponds are small, enclosed freshwater habitats that, in today's context, can provide safe havens for all endangered wetland species whose habitats, such as marshes, temporary wetlands, and floodplains, are disappearing. The importance of ponds has long been underestimated and neglected; therefore, ponds are often excluded from protection systems, despite being valuable water bodies that are biologically, scenically, and culturally among the most valuable legacies we have in karst regions.

Although ponds are small water habitats, their significance is vastly disproportionate to their size. They are crucial for the survival of endangered animal and plant species, as well as being cultural and historical monuments in the landscape, testifying to their historical role as sources of drinking water for humans and livestock in water-scarce karst areas. Today, by restoring and especially constructing new ponds, we can mitigate the effects of climate change, which is accelerating the disappearance of all moist habitats.

By constructing ponds, we proactively adapt to the increasing climate changes, providing a refuge for plant and animal species in the water of the ponds. Building new ponds ensures the maintenance and growth of biodiversity in a particular area by bringing water to it. The water in the pond offers services to all ecosystems, while the pond itself becomes a unique ecosystem within the karst region, serving as a substitute for all the moist ecosystems that are disappearing due to global warming.

The oldest artificial form of drinking water accumulation is the "Drainage Pond," built on a man-made waterproof base. A pond is the only human intervention in nature that has increased biological diversity and enriched the landscape. Settlements were established around ponds, and ponds were created within settlements, as we know life is impossible without water. With the development of livestock farming, humans needed to build more ponds, spreading hundreds of artificial drainage ponds among the natural drainage areas. By constructing a waterproof layer using organic and inorganic materials, humans mastered the water-scarce karst regions; building drainage ponds eliminated barriers to settling in any part of the karst. On a didactic farm or wherever you choose, dig a depression and create a base using impermeable material, either natural (such as clay) or artificial.

e-HANDBOOK

SustainStudy: „Improving knowledge and skills by connecting the sustainable development goals oriented towards the topic of water with the curriculum for primary schools“

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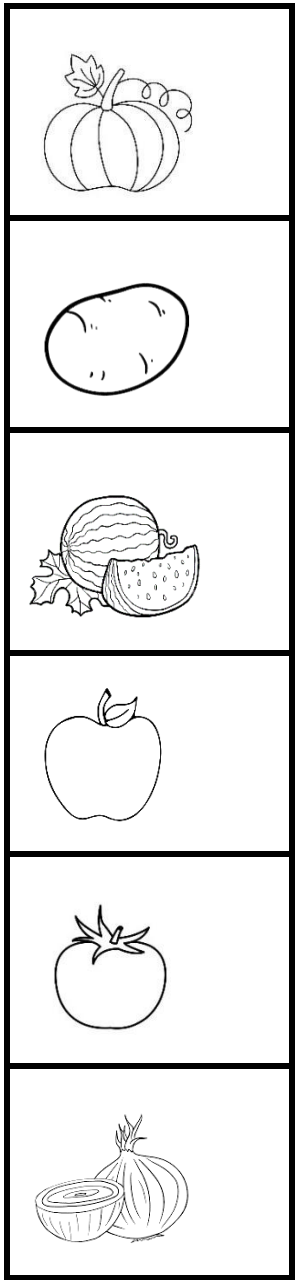
PLANTS AND THEIR ORIGIN

- Write the names of the continents on the world map.
- Draw the discovery routes you are researching.
- Draw the plants at their place of origin.

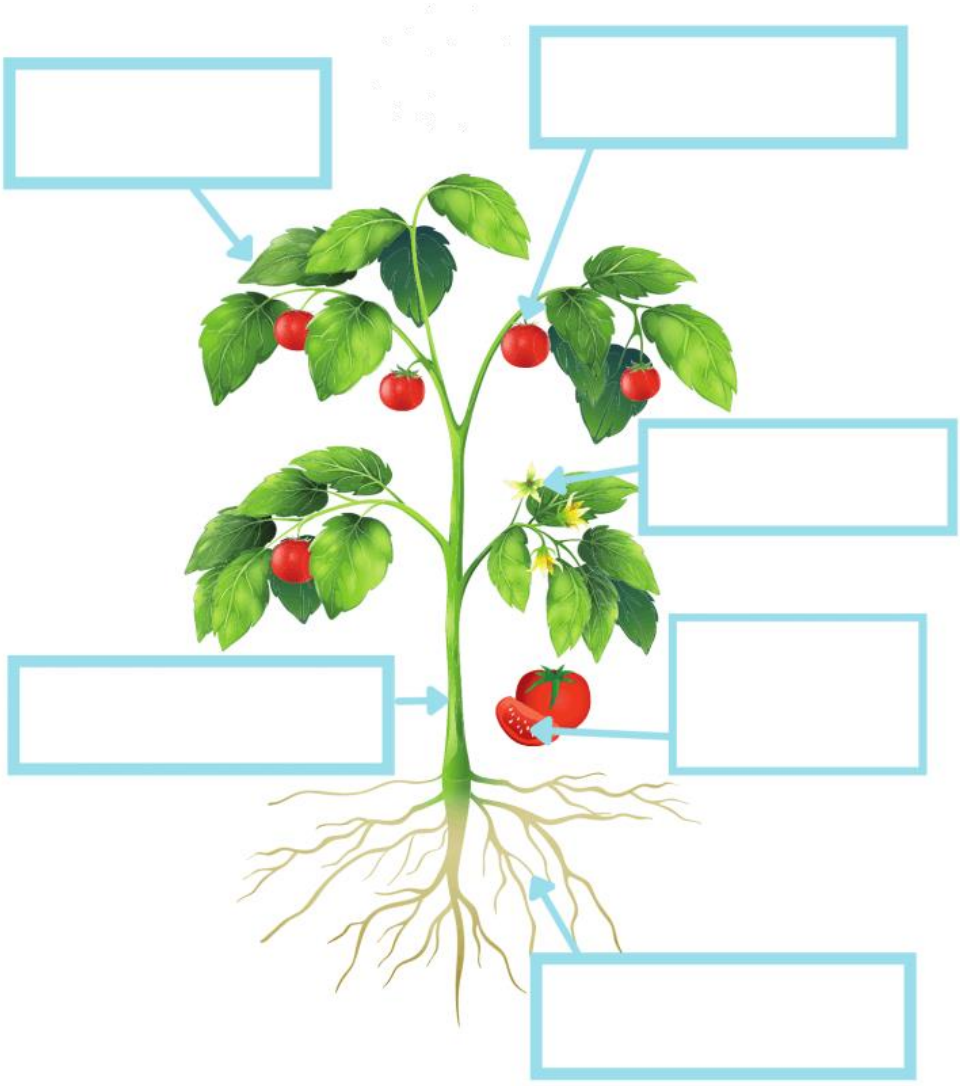
PLANTS AND THEIR ORIGIN

- Write the names of the continents on the world map.
- Draw and color the plants on a larger piece of paper or cardboard.
- After guessing which plant it is, place the plant at its place of origin.



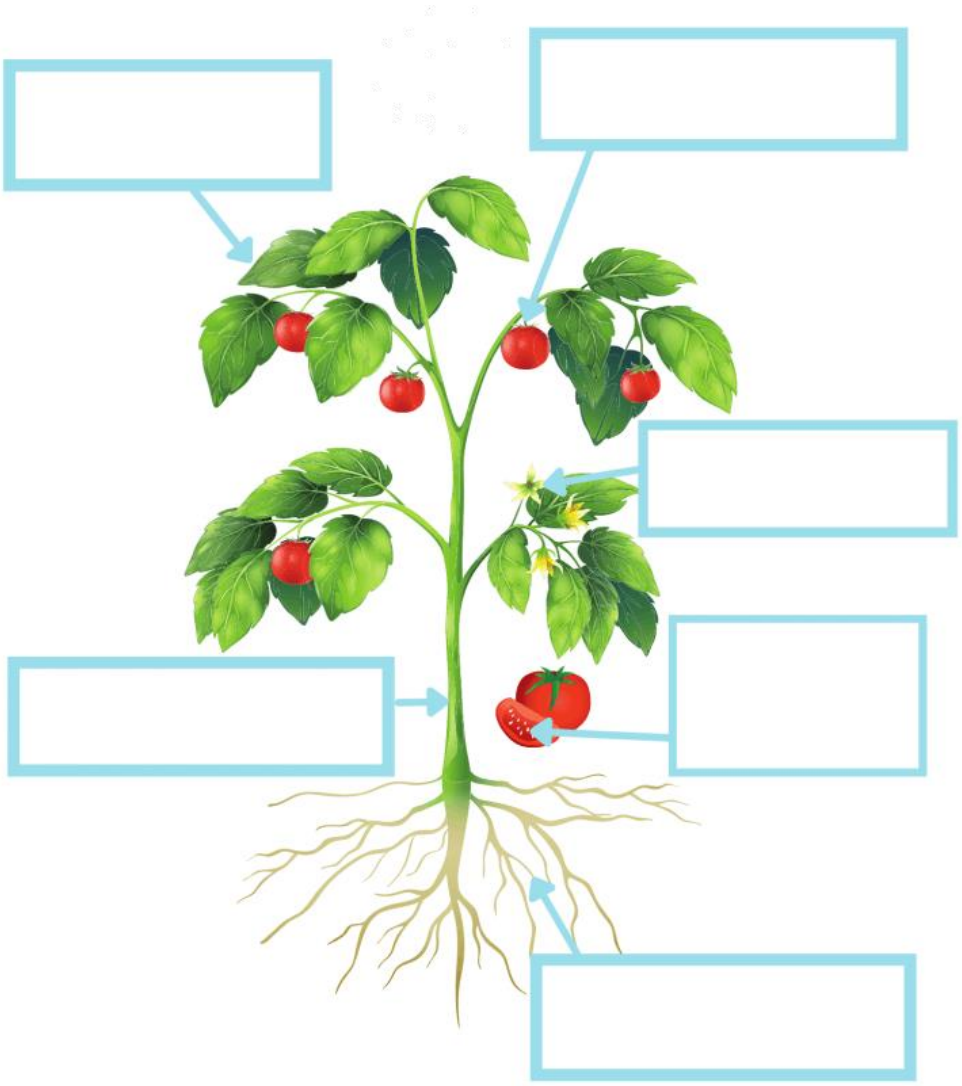
PARTS OF PLANT AND THEIR FUNCTION

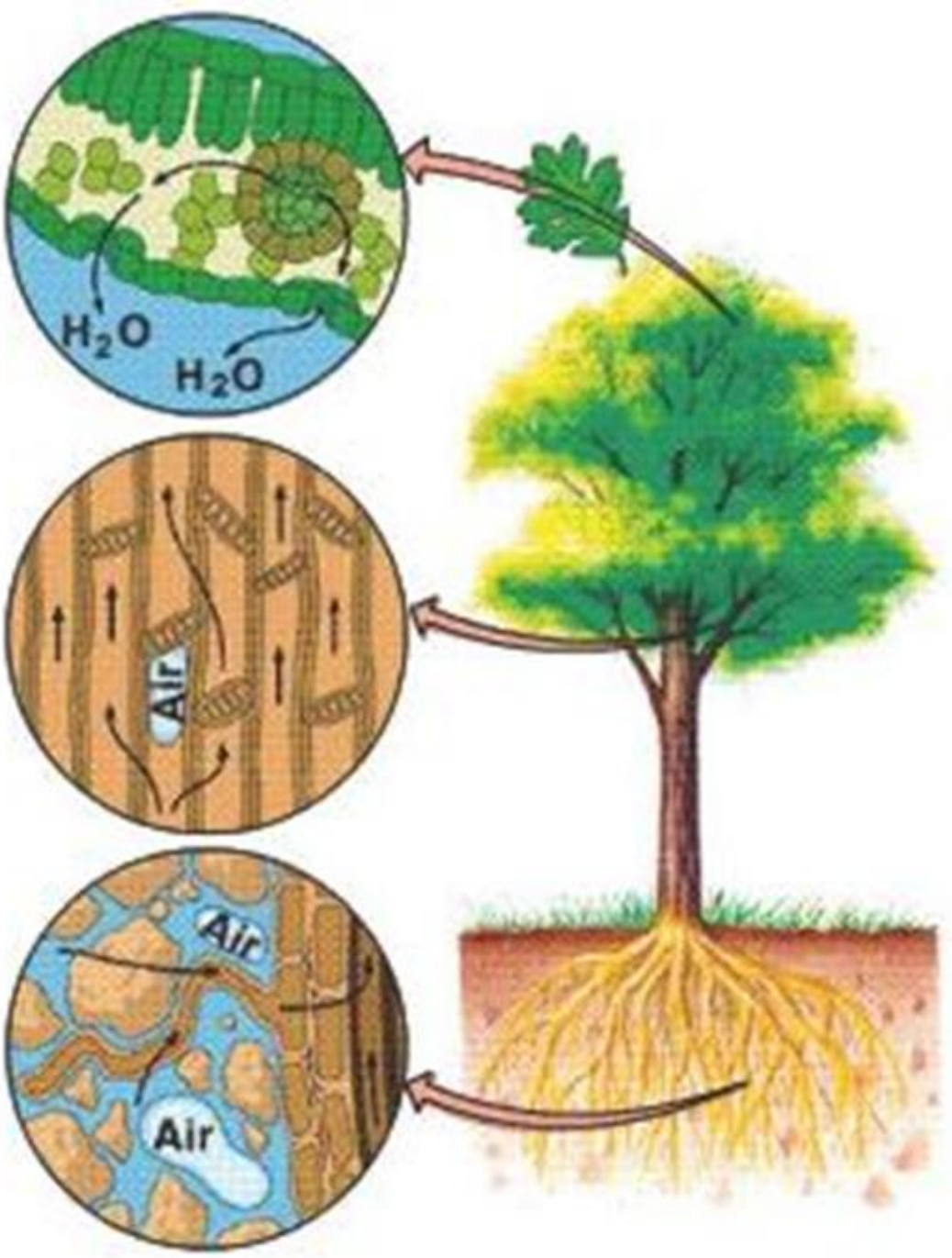
Label the parts of the plant and explain the purpose of each part.



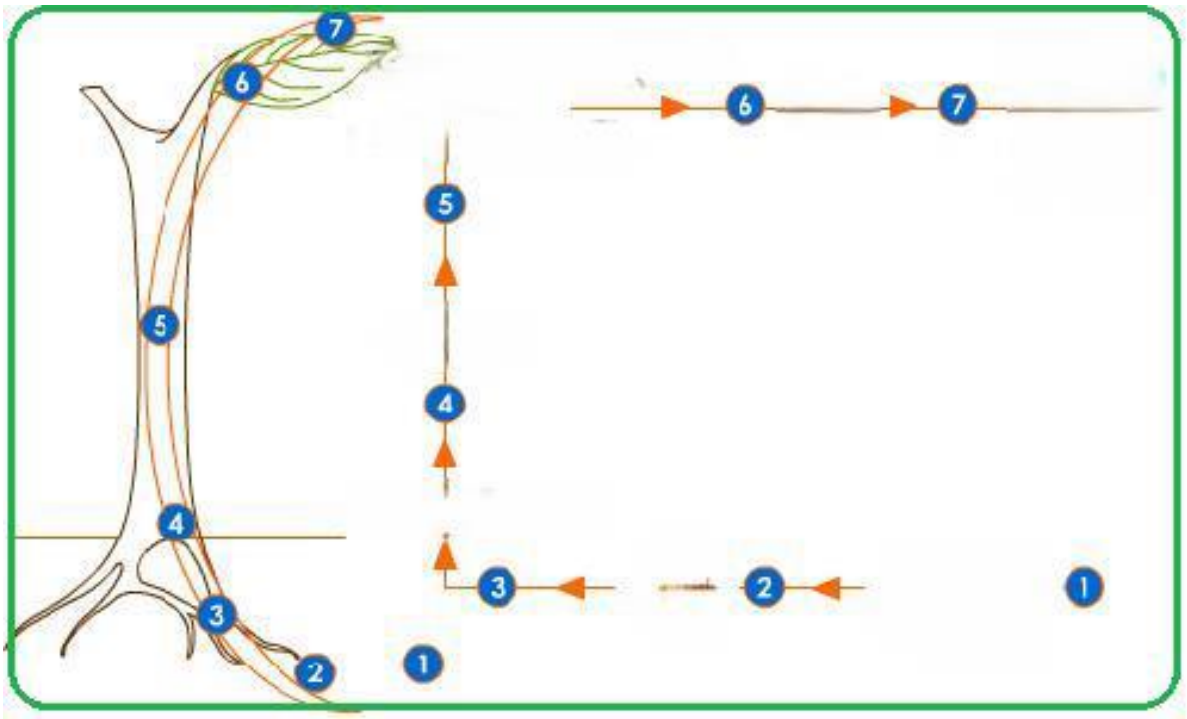
PLANTS AS A FOOD

In the fields, write the names of plants and the parts we eat.





Label and Explain the Processes of Transpiration and Evaporation in Plants



Find the right place:

Water in the soil - The starting point where the plant absorbs water.

Root hairs - Structures on the root that absorb water from the soil.

Root collar - The part of the root that connects the root to the stem.

Xylem - Tissue that transports water and dissolved nutrients from the roots through the stem to the leaves.

Movement through xylem - The process of water transport through the xylem from the roots to the leaves.

Movement through stomata - The process where water in the form of vapor exits the plant through small openings on the leaves called stomata.

The carp lives in calm and warmer waters and can reach a length of one meter and a weight of over 20 kg. It has an elongated, rounded body and a large head with its mouth surrounded by four barb-like protrusions. The carp is the most significant fish in lowland rivers both from a sporting and economic perspective. The carp's homeland is Asia, but it now inhabits all continents. The first carp came to Europe during the Roman Empire. At that time, carp was considered an unusual culinary delicacy. It was later introduced to North America and Australia. The carp is a freshwater fish, highly adaptable and resistant to changes in its environment. This is why it is one of the most popular fish species targeted by anglers worldwide. After 500 years of selective breeding, there are now many subspecies of carp.	The Carp 
The trout family includes agile and fast fish with elongated, slender bodies. Their habitat consists of mountainous rivers and streams, although some species later migrate to the sea. They are carnivorous, with a large part of their diet consisting of insects. They are indicators of clean water. Their mouths contain a single row of sharp teeth. The brook trout is distinguished by red or black spots on its body. The reddish spots are usually smaller and can range from bright red to light red. During spawning, the colors become more intense, vibrant, and beautiful. Trout living in shallower, gravel-bottomed waters are usually lighter in color, while those inhabiting deeper waters, caves, or grottoes are almost black.	The Trout 
The octopus is a mollusk. It has 8 arms and can reach a length of up to 3 meters. It is excellently adapted to both hunting and being prey. It has a secret weapon, hiding a sac of ink in its body folds, which it releases to confuse its enemies. Its sac-like body hides a well-developed brain and nervous system, making the octopus an unexpectedly intelligent marine animal. It is an important inhabitant of the sea floor, living in rocky shores and spending most of its time in holes or crevices in shallow water. It prefers to retreat to the same shelter repeatedly. The shelter is recognized by the neatly arranged larger and smaller stones in front of the hole. An octopus submerged in fresh water dies within a few seconds..	The Octopus 

Seed pouch

Name of plant _____

Origin of plant _____

Collection date _____

Time and conditions required for drying

_____

_____

Planned sowing time _____

TABLE 1.

1st WEEK	Snack provided at school	FROM:	TO:
MONDAY			
TUESDAY			
WEDNESDAY			
THURSDAY			
FRIDAY			

TABLE 2.

2nd WEEK	Snack provided at school FROM: TO:
PONEDELJAK	
MONDAY	
TUESDAY	
WEDNESDAY	
THURSDAY	
FRIDAY	

TABLE 3.

3rd WEEK	Snack provided at school FROM: TO:
MONDAY	
TUESDAY	
WEDNESDAY	
THURSDAY	
FRIDAY	

TABLE 4.

4th WEEK	Snack provided at school FROM: TO:
MONDAY	
TUESDAY	
WEDNESDAY	
THURSDAY	
FRIDAY	

TABLE 1.

1st WEEK	Snack brought from home	From:	to:
MONDAY			
TUESDAY			
WEDNESDAY			
THURSDAY			
FRIDAY			

TABLE 2.

2nd WEEK	Snack brought from home	From:	to:
MONDAY			
TUESDAY			
WEDNESDAY			
THURSDAY			
FRIDAY			

TABLE 3.

3rd WEK	Snack brought from home From: to:
MONDAY	
TUESDAY	
WEDNESDAY	
THURSDAY	
FRIDAY	

TABLE 4.

4th WEEK	Snack brought from home	From:	to:
MONDAY			
TUESDAY			
WEDNESDAY			
THURSDAY			
FRIDAY			

TABLE 1. Food Waste in Households

1st WEEK					from:			to:	
	FRUITS	VEGETABLES	MEAT AND MEAT PRODUCTS	LIQUID FOOD: MILK, JUICE, SOUP……	DAIRY PRODUCTS	BREAD, PASTRIES, PASTA	SWEETS	FOOD WASTE FROM PREPARATION	OTHERS
MONDAY									
TUESDAY									
WEDNESDAY									
THURSDAY									
FRIDAY									
SATURDAY									
SUNDAY									

TABLE 2. Food Waste in Households

2nd WEEK	from:			to:					
	FRUITS	VEGETABLES	MEAT AND MEAT PRODUCTS	LIQUID FOOD: MILK, JUICE, SOUP……	DAIRY PRODUCTS	BREAD, PASTRIES, PASTA	SWEETS	FOOD WASTE FROM PREPARATION	OTHERS
MONDAY									
TUESDAY									
WEDNESDAY									
THURSDAY									
FRIDAY									
SATURDAY									
SUNDAY									

TABLE 3. Food Waste in Households

3rd WEEK				from:			to:		
	FRUITS	VEGETABLES	MEAT AND MEAT PRODUCTS	LIQUID FOOD: MILK, JUICE, SOUP……	DAIRY PRODUCTS	BREAD, PASTRIES, PASTA	SWEETS	FOOD WASTE FROM PREPARATION	OTHERS
MONDAY									
TUESDAY									
WEDNESDAY									
THURSDAY									
FRIDAY									
SATURDAY									
SUNDAY									

TABLE 4. Food Waste in Households

4th WEEK	from:	to:							
	FRUITS	VEGETABLES	MEAT AND MEAT PRODUCTS	LIQUID FOOD: MILK, JUICE, SOUP……	DAIRY PRODUCTS	BREAD, PASTRIES, PASTA	SWEETS	FOOD WASTE FROM PREPARATION	OTHERS
MONDAY									
TUESDAY									
WEDNESDAY									
THURSDAY									
FRIDAY									
SATURDAY									
SUNDAY									

Shopping List for Basic Groceries

This is a very simple table that will help you plan your shopping for a longer period, reducing trips to the store and allowing you to buy and spend more efficiently.

Explanation of the Table

The left side is designed for meal planning, focusing on lunch, and is divided into 14 days. You can plan a single meal for multiple days if you wish.

On the right side, you list the ingredients you need to prepare the meals, plus there is a column labeled 'Where' where you can note which store you will buy each ingredient from. This way, you can better plan your shopping routes and determine which stores to visit, reducing transportation costs.

Meal and Shopping Plan

Breakfast (basic ingredients)

Dinner (basic ingredients):

Lunch

1

2

3

4

5

6

7

8

9

10

11

12

13

14

Shopping

Food: Where:

Food: Where:

Others: Where:

Meal Plan – How to Create a Healthy Nutrition Program?

A meal plan is created based on your goals, habits, and lifestyle, and it involves combining different types of foods in specific quantities.

No offense intended, but even a fool with a plan can outperform a smart person without one. That's why I believe that almost everything in life should be planned, especially something that occurs multiple times a day and significantly impacts the quality and longevity of life.

In the following text, you will learn how to create a meal plan and combine different categories and quantities of foods according to your goals and lifestyle.

Types of Food – Categorization of Food Items

To create a meal plan with adequately combined foods, you first need to understand the different types of food. So, I'll categorize them as follows:

Proteins – Eggs (boiled, omelet), beef, chicken, turkey, fish (salmon, mackerel, sea bass, gilt-head bream, carp, scorpionfish...), lamb, soy (tempeh, tofu).

Fats – Bacon, nuts (raw or roasted), olive oil, coconut oil, lard, ghee butter, olives, avocado, cocoa (unprocessed), nut butters (peanut, almond, sesame, pumpkin seed), flax seeds, sesame seeds.

Carbohydrates (starches) – Quinoa, amaranth, millet, couscous, beans, green beans, buckwheat flakes, lentils, rice (brown, red, black), sweet potatoes, potatoes, 100% whole grain bread, flours.

Vegetables (fiber) – Mushrooms, cabbage, broccoli, cauliflower, kale, Brussels sprouts, lettuce, iceberg lettuce, asparagus, celery, parsley, zucchini, bell peppers, cucumbers, tomatoes, onions (red, white, green), eggplant, beets, carrots.

In addition to the foods listed above, which are most commonly used, there are many other foods you can incorporate into your meal plan. However, make sure to categorize them correctly. By checking the nutritional composition and identifying the dominant macronutrient, you'll easily determine which category they belong to.

Foods are categorized based on the dominance of a specific macronutrient (protein, fat, carbohydrates). For example, tofu is classified under proteins because proteins are the dominant macronutrient in tofu, although it also contains fats and carbohydrates. Similarly, all legumes, especially beans and lentils, as well as quinoa, contain significant amounts of protein, but carbohydrates are the dominant macronutrient.

When preparing meals, to ensure they are both tasty and healthy, you are allowed to use all types of herbs and spices. Vinegar (alcohol, apple cider), balsamic vinegar, and lemon juice are also permitted.

Does a Healthy Meal Plan Include Fruit Consumption?

Fruit is not listed as a separate category, but it is allowed, especially berries (cranberries, blueberries, raspberries, blackberries, strawberries, chokeberries...), as well as other fruits. When creating a meal plan, it's recommended to consume fruit in the first part of the day, and the quantity should depend on your actual carbohydrate needs.

The general recommendation is to obtain about 30% of your total carbohydrate intake from fruit because, in addition to carbohydrates, fruit also provides a significant amount of vitamins, minerals, antioxidants, and bioflavonoids.

If possible, I suggest choosing organic and freshly picked fruit, as you will gain the most benefits from such produce.

What About Dairy Products?

Minimize the consumption of dairy products, as adults gain little to no benefits from them. The exception is goat whey, which can be beneficial in certain liver and lung conditions. If you enjoy consuming dairy products, it’s best to choose those made from goat milk.

Additionally, be mindful of the sources of the raw materials used in the production of dairy products, and ensure that no additives such as emulsifiers, sugars, or vegetable fats have been included during the manufacturing process, as these can turn a “healthy” product into an “unhealthy” one.

Before I move on to the rules for mixing these foods to create a meal plan, let's clarify that there are no specific foods or meals designated for breakfast, lunch, or dinner. So, there's nothing wrong with having chicken, salmon, or another type of fish for breakfast—it’s all a matter of habit. It's true that some foods are "heavier" on the stomach and take longer to digest, and this should guide your choices.

Combining Foods for a Meal Plan: Rules for Combining Different Food Categories

How can you create a meal plan where foods from different categories are adequately combined?

Avoiding foods from the third category (carbohydrates) for breakfast allows your body to use fats as fuel for physiological functions and helps prevent feeling sluggish and low in energy due to a significant insulin spike from metabolizing sugars, which are dominant in carbohydrates. Combining fats and proteins for breakfast will also help wake you up, boost your energy, and improve your mood. It is advisable to choose one food item from each of the first, second, and fourth categories for breakfast, while keeping the fat intake moderate. To avoid making mistakes when creating a healthy meal plan, use a nutritional table or app to check the nutritional composition of foods until you become familiar with the content of frequently used ingredients. An exception to this rule might be when you have a high-intensity activity scheduled immediately after breakfast, such as physical work or a vigorous workout.

For lunch, create your combination using one item from each category, while keeping the fat content low, as you’ve already included fats at breakfast and will include some at dinner as well. Dinner can be similar

to breakfast in terms of choosing items from the categories, focusing on a combination of proteins and fats with very few or no carbohydrates. You can have fruit half an hour before lunch or dinner, or in some protocols, start your day with fresh fruit. This dietary program is suggested for healthy individuals with a sedentary lifestyle or low to moderate activity levels. To create a personalized healthy eating plan, you need to consider various parameters such as activity level, habits, job, health status, and goals.

Healthy Eating Plan – How Much Food Do You Need?

The key parameters for determining the amount of food for an adequate eating plan are caloric intake and the intake of macronutrients (proteins, fats, and carbohydrates). Tracking caloric intake and macronutrients can be done accurately using a scale and nutritional table apps, such as MyFitnessPal. For most people, a more practical approach is estimating portion sizes: a piece of meat the size and thickness of your hand, 3-5 eggs (3 yolks), 4-5 thin strips of bacon, at least 150 grams of vegetables per meal, a handful of olives or nuts, one tablespoon of olive oil, and one teaspoon of butter.

Micronutrients (vitamins, minerals, antioxidants, bioflavonoids) are also important, and can be adequately obtained by consuming high-quality, minimally processed foods and maintaining variety in your diet. With such a structured meal plan, you'll likely notice improvements in energy levels, mood, productivity, and overall physical appearance within a few days.

What is the Thermic Effect of Food and How Does It Affect Your Diet Plan?

The Thermic Effect of Food (TEF) refers to the amount of energy required to chew, transport, digest, absorb, distribute, and store nutrients from food. Research indicates that TEF accounts for approximately 10% of the total daily energy expenditure. This percentage varies based on the type of food and the predominant macronutrients in the diet.

Proteins have the highest thermic effect, consuming around 30% of the total caloric value of the food for processing. For example, if you consume a piece of chicken with 300 kcal, about 90 kcal will be used to process the protein. Carbohydrates have a significantly lower thermic effect, ranging from 5-15%, and fats have a TEF of about 7%.

The thermic effect of carbohydrates varies based on their form and processing level. Whole grains and minimally processed foods generally have a higher TE compared to refined and heavily processed products. Eating foods in their natural, less processed state can help maximize TE and contribute to overall better health.

TABLE – Observations on Landfills

	Description of observations
Try to describe landfills – colors, shape, size, additional features:	
Is there a smell at the landfill? Describe it!	
Is there smoke at the landfill?	
Do you notice any animals at the landfill?	
Are there waste separation lanes?	
Does the landfill have a recycling yard?	

Why is it dangerous to throw food waste in a landfill?

Food waste that ends up in a landfill gets mixed with other types of trash and can be harmful to the environment. It decomposes in the absence of oxygen—anaerobic digestion facilitated by microorganisms—and produces substances that are toxic and carcinogenic, negatively impacting the environment.

What happens during anaerobic digestion?

Food waste remains trapped in a landfill beneath layers of other types of waste, preventing oxygen from reaching it. This creates anaerobic conditions. Over time, microorganisms start a chemical reaction that releases methane (CH_4). Methane is not toxic, but it is 72 times more harmful to the ozone layer than CO_2. It remains in the atmosphere for about 10 years before breaking down into CO_2 and H_2O. Methane is also flammable, so when it is trapped in a landfill, it often ignites, potentially causing fires. This can result in the landfill "burning by itself," releasing toxic gases into the atmosphere, which can lead to suffocation or respiratory problems in people.

Methane Combustion:

This process is called pyrolysis, which leads to the formation of carbon monoxide (CO). This is a very toxic gas. The reaction is:

$CH_4 + O_2 \rightarrow CO + H_2 + H_2O$

After oxidative pyrolysis, hydrogen undergoes oxidation, producing water and energy, while carbon monoxide is also oxidized to form carbon dioxide.

Methane and carbon dioxide are gases that contribute to the damage of the ozone layer, which is already significantly depleted.

Composting as a Natural Process

In the natural nutrient cycle, we observe the process of composting carried out by nature itself each year, particularly in forests, parks where leaves are not collected, and in gardens where permaculture practices are used. Fallen leaves under trees and plant remnants, combined with existing layers of accumulated plant matter, decompose over time with the help of microorganisms and turn into compost.

In controlled, designed conditions, humans organize this process by simulating natural conditions. After 6-12 months, high-quality, healthy compost can be used.

Plant Remnants in a Compost Pile: The Beginning

After One Month: The Compost Pile

After one month, the compost pile should start showing signs of decomposition. The materials within the pile will begin to break down, and you may notice that the temperature inside the pile has increased due to microbial activity. The original plant remnants and other organic matter will start to become less recognizable and more integrated into a dark, crumbly substance. Regular turning and maintaining moisture levels will help accelerate this process, ensuring a high-quality compost.

Compost Pile

Turning the Compost Pile: Two to Three Months In

During the process of turning the compost pile two to three months after starting, you should observe that the pile has developed a high temperature due to active microbial activity. Turning the pile helps to aerate it and distribute heat evenly, promoting faster decomposition. At this stage, the compost should be breaking down significantly, with the materials becoming darker and more homogeneous. The high temperature is a sign of efficient microbial activity working to decompose the organic matter.

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Composting Near the End: 5-6 Months

At the 5-6 month mark, the composting process should be nearing completion. The compost pile will have significantly decomposed, with most of the original materials breaking down into a dark, crumbly, and earthy-smelling substance. The high temperatures of earlier stages will have decreased, and the compost will have a more uniform texture. If the compost is still not fully mature, occasional turning and maintaining proper moisture levels can help finalize the process, ensuring the compost is rich in nutrients and ready for use.

Completed Composting: Before Sieving

At the end of the composting process, before sieving, the compost should be fully decomposed and have a dark, crumbly texture with an earthy smell. The original plant materials should no longer be recognizable, having broken down into a nutrient-rich substance. This final compost should be well-mixed and uniformly decomposed, indicating that it is ready to be sifted or sieved to remove any remaining larger particles or non-decomposed materials before use.

Sieving Compost for Garden Use

Sieving compost involves passing it through a screen or mesh to remove any remaining large particles or undecomposed materials. This process helps to refine the compost, ensuring that only fine, nutrient-rich material is left. The sieved compost is then ready to be used in the garden, where it can be applied as a soil amendment, mulch, or planting medium, enriching the soil and supporting plant growth.

Composting in Home (or School) Conditions

Composting at home or in a school setting involves creating a small-scale compost system to manage organic waste. This process can be done using compost bins, tumblers, or simple piles. Key steps include:

Choosing a Location: Select a well-drained, shaded area for the composting setup. For indoor composting, consider using a compact bin with a lid to control odors.

Adding Materials: Combine green materials (e.g., fruit and vegetable scraps, coffee grounds) with brown materials (e.g., leaves, paper). Maintain a balanced mix to promote healthy decomposition.

Maintaining the Pile: Ensure proper aeration by regularly turning the compost. This helps to mix the materials and provide oxygen, which speeds up the decomposition process.

Monitoring Moisture: Keep the compost moist but not waterlogged. The ideal moisture level is similar to that of a wrung-out sponge.

Harvesting the Compost: After several months, the compost should be dark, crumbly, and have an earthy smell. Sift it to remove any large particles before using it in gardening or plant care.

Brief Guide to Home Composting:

Container Needed: Use a container with a capacity of 30-50 liters. A plastic container labeled as food-safe, a wooden box, or preferably a clay pot (such as an old flower pot) is ideal.

1. Drill Small Holes in the Container: It is beneficial to make a few small holes in the container. Drill holes in the bottom for draining excess liquid, if it accumulates, and on the sides to allow air to enter, as composting is an aerobic process and requires oxygen (O2).

2. Place the Container: Set the container in a location where it won't be in the way. Put a layer of dry twigs, cardboard, and paper at the bottom. Then add food scraps and a small amount of existing compost, humus, or forest soil. This helps to quickly establish microorganisms, which are key to the composting process along with earthworms.

Food Preparation Waste: All food scraps are allowed except for those that are cooked, greasy, or heavily seasoned. Avoid adding onion skins, which produce an unpleasant odor, citrus peels due to their acidity and treatment with antibiotics, meat, and colored paper. Pine needles can acidify the compost, but they are welcome if you are composting for plants that prefer acidic soil. Walnut leaves decompose slowly and are safe only after a year of decomposition. Egg shells should be crushed, and coffee grounds should be drained and dried.

Layer the compost pile by alternating between green and brown materials.

Brown Materials: Use paper without chemical dyes, paper towels, toilet paper rolls, cardboard without plastic strips, twigs, dry leaves, straw, and hay. It is best to shred these materials as much as possible.

Occasionally mix the compost by hand. This helps you feel if the composting process is active (the mass should be warm) and determine if it needs a little water by spraying. You will notice warmth and a pleasant composting smell, similar to the scent of a forest after rain. Don’t be surprised if you find earthworms—they are very beneficial.

Over time, the compost pile begins to reduce in volume as it compresses. To avoid stopping or slowing down the composting process, collect new amounts of green materials in a second container in the same manner after three months. By properly managing composting, you can achieve results within a maximum of 6 months, while working with two containers simultaneously, with one always being filled with fresher materials.

HYPOTHESIS : Developing Biogas from organic food waste

Organic Food Waste in Our Household:

Potato peels, orange peels, apple peels, kiwi peels, onion peels
Leftover food that hasn't been eaten
Paper
Place all of these in a 5-liter plastic canister and seal it tightly without opening for at least 5 days.

After 5 Days:
The container was inflated with condensed moisture on the walls. When the cap was unscrewed, the gas began to hiss with a slight explosive sound upon opening. This gas is methane, produced through fermentation in the absence of air, along with other gases with an unpleasant odor.

How Water Shapes the Landscape

Water shapes the landscape through various processes of erosion, transport, and sedimentation. Here's how it happens:

Erosion: Water, whether in the form of rivers, rain, or ice, can carry material along its path. Through erosion, water removes layers of soil and rock, leading to the formation of valleys, canyons, and gorges. For example, rivers flowing through mountains can create deep valleys and canyons.

Transport: Water transports eroded materials such as sand, gravel, and rocks downstream. These materials can be deposited in new areas, forming plains and deltas at the river's mouth.

Sedimentation: When water loses its strength or speed, the materials it carries are deposited. This process can create features like beaches, deltas, and coastal plains. For instance, a river delta forms when sediment is deposited at the river's mouth into a sea or lake.

Glaciers: In glacial regions, glaciers can erode soil and rock as they move, leaving behind characteristic landforms such as fjords and moraines.
Submarine Erosion: In seas and oceans, waves and ocean currents can erode coastlines, creating features like sea cliffs and caves.
Together, these processes contribute to shaping various landforms on Earth, such as mountains, valleys, plains, and coastlines.

Watch the video!
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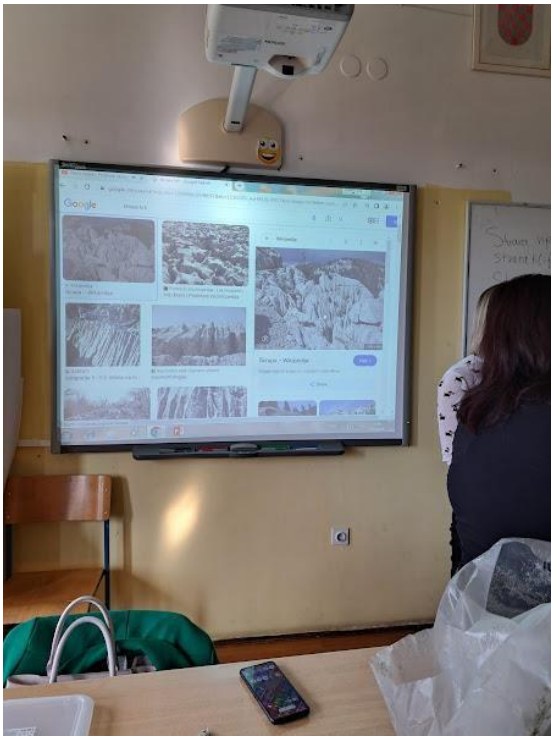


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Worksheet
12

Grade: 6th and 7th Grade
Field Trip: Visit to the Waterworks
Lesson Type: Field, Combined
Number of Class Hours: 6

Learning Outcomes:

Describes the importance of water sources for the local population
Explains the importance of conserving and protecting water
Explains the importance of water conservation

Objectives:

Encourage students to apply their knowledge from geography and biology
Review and reinforce general knowledge about water
Students will observe how their region is supplied with water
Learn about the importance of water sources
Review knowledge about lakes and the properties of water
Reinforce the importance of water conservation in households and other places where we spend time (e.g., kindergartens, schools)

Evaluation of Outcomes and Learning Process at the End of the Lesson:

Assessment for Learning: Observation and providing feedback to students
Assessment as Learning: Evaluation of group work

Instructions for Conducting the Lesson:

Departure from school by bus
Workshop and lecture at the Waterworks
Tour of the Waterworks complex with interim lectures
Visit to water sources
Continuous maintenance of a field journal
Evaluation: worksheets and review
Creation of posters or models after the visit, during school classes

Creating a Biological Wastewater Filter

Required:

1.5-liter plastic bottle with a cap

Scissors

Cotton balls

A few tablespoons of sand

A few tablespoons of gravel

A few chunks of charcoal (can be for grilling)

Jar with dirty water

Instructions:

Cut the bottom off the plastic bottle using the scissors.
Place a layer of cotton balls at the neck of the bottle to act as a filter.
Add a layer of sand on top of the cotton balls.
Next, add a layer of gravel on top of the sand.
Place the chunks of charcoal on top of the gravel.
Pour the dirty water into the bottle and let it filter through the layers.
Collect the filtered water from the bottom of the bottle.


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Attc. Table 1.

Students record the following in a table: Taste, Visual appearance, Mineral composition **Age: _____ , sex: _____**

	TASTE OF WATER							
Sample	**salty**	**sweet**	**sour**	**bitter**	**Mineral Composition**	**Presence of Bubbles**	**Absent of Bubbles**	
Tap water								
Non-Sparkling Water from Glass Bottles								
Non-Sparkling Water from Plastic Bottles								
Sparkling Water (Choice 1)								
Sparkling Water (Choice 2)								

Students should place an asterisk (*) in the last column if they like the taste of the water sample.