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Project: Innovative STEPS **(Innovative Sustainability Education for Prosperous Schools**
Project Agreement Number : 2022-1-SK01-KA220-SCH-000085417

1. Ecosystem

Poster *Ecosystem*

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Introduction to the topic

An ecosystem is a general term for a system of living and non-living components of the environment that are interconnected in some way. They can be of different sizes, but even the smallest ones form an important component of nature.

Some of them affect its balance.

Some ecosystems are under constant pressure from human intervention and climate change, which can lead to their collapse or even extinction. However, nature provides vital functions for human well-being, and therefore it is very important for people to pay attention to this issue and ensure the health of all ecosystems.

Objectives:

The student can:

- Creatively display the selected ecosystem
- Find on the Internet and assign elements to the given ecosystem
- Describe individual components and explain their function
- Present your created project

Tools and materials:

Things you need:

- Watercolors
- Markers
- Scissors
- Glue
- Internet
- Printer

Material:

- Paper pieces
- Paper
- Worksheet

Teaching organization:

- For an introduction to the topic, it is possible to use face-to-face teaching
- Furthermore, it is advisable to use the worksheet as part of independent work, on the contrary, the control could take place through a joint discussion
- In the practical part, students work in groups on assigned types of ecosystems
- After the practical part, it is advisable for each group to present its results in front of the rest of the class
- If there is enough time, it is possible to end the lesson with a joint discussion

Tasks:

- Introduction to the topic - students will get to know the term Ecosystem
- Worksheet - pupils will prepare a worksheet and answer basic questions about the topic of ecosystems
- Practical part - pupils in groups using the Internet will make a poster about specific types of ecosystems
- Presentation – a selected student from each group presents their created poster

Methodological guidelines

- In the theoretical part, students will review the issues of the ecosystem, its species and functions.
- In the practical part, they will create different types of their own ecosystems on Thursday with the help of paints, scissors, glue and the Internet.
- At the end of the practical part, it is appropriate for the students to present their short projects to the rest of the class.
- Subsequently, the class can discuss the functions of given ecosystems and their other components.

Methodological guidelines

- The time estimate for the activity is 45 minutes.
- The theoretical part should take approximately 15 minutes and the practical part the rest of the hour.
- The time required to create a poster may vary, depending on the chosen difficulty and the age of the students.
- It will also depend on the creativity and abilities of the students, or even on their innovation.
- It is important that the pupils cooperate.
- In case it is necessary to save time, or if computers are not available, it is possible for the teacher to prepare sticky pictures in advance.
- At the end, it is appropriate to hold a discussion on the given topic.

Methodological guidelines

- In the theoretical part, it is not so important that the students themselves answer everything correctly, but that they remember the basic concepts of this topic and then be better able to create their own posters.
- A suitable method before solving the worksheet is a guided discussion - this way the students can be sure that they have the answers that will help them in the next exercise.
- At the same time, it is also important that the students are aware of the essence of the activities, both in the theoretical and the practical part. This is not only about divided ecosystems, but also about the global ecosystem of the entire planet Earth, made up of partial ecosystems from the posters. Human influence on natural ecosystems is also important.

Topic 1: How do we divide ecosystems?

a) Natural and cosmic

b) Natural and artificial

c) Nature and artificial

d) I don't know

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2. Natural resources

Renewable, non-renewable and sustainable use of sources of electricity production

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Introduction to the topic

We often hear about energy sources, especially where to get electricity in harmony with nature. When we look around us, we see many devices that run on electricity. Do we need to run a washing machine at home, fill up on gas at a gas station, pay with a credit card in a store? These are just a few examples of what we need electricity for. Let's face it, we are dependent on it and without its power we would go back several centuries. If we want to continue to enjoy the benefits of the scientific and technological revolution and modern technologies, we cannot do without electricity.

- Electricity consumption is growing despite the increasing efficiency of appliances, but where can we get it in the necessary quantity and in harmony with nature?
- Old cars with combustion engines may eventually be replaced by electric cars, but where will we get the extreme increase in electricity consumption?
- Where is electricity produced? Everyone knows this, of course, but will it be enough? And how will this production be in harmony with nature?

There could be many more questions about electricity production. Yes, today we already have solutions that work in harmony with nature.

Let's take a look at the options we have and how to navigate their advantages and disadvantages.

We use different types of power plants to generate electricity:

- Coal-fired power plants
- Gas-fired power plants
- Nuclear power plants
- Hydropower plants
- Photovoltaic power plants
- Wind power plants

You probably all know these power plants and they are located somewhere in your area. We also have other power plants, such as wave, tidal, geothermal, etc. But do we use them here? No.

When it comes to nature, renewable sources are the best for us, i.e. power plants that use inexhaustible natural resources.

Nuclear power plants are currently a kind of specialty. Basically, it is the splitting of atoms, which releases a significant amount of thermal energy. It is not a renewable energy source, but it has many advantages and considerable performance. Currently, it is the only technology capable of providing enough electricity for our homes, industry, and perhaps even electromobility, while producing no harmful gases, only a limited amount of nuclear waste.

Concept

- The aim of the tasks is to understand the basic issues of renewable and non-renewable sources of electricity production.
- Try to induce critical thinking in students.
- Pupils can discuss, present arguments and listen to others.

Technical terms

- There are several terms for some production sources of electrical energy.
- The student will get an overview of the types of production sources of electrical energy from the point of view of several names used.
- Pupils will gain a critical view of the advantages and disadvantages of individual sources of electricity production in the context of environmental impact.

Organization of Teaching

- For a basic introduction to the subject by the teacher, it is possible to use the frontal method.
- Furthermore, students ideally work in pairs.
- Independent student work is also possible, but it may not suit all students.
- Larger groups usually lead to inactivity of other group members.
- The students' mutual discussion leads to a deepening of critical thinking, the ability to communicate, formulate ideas and present.

Tasks

1. Task: the essence of the task is to find out what electricity we have, how we depend on this energy.
2. Task: the essence of the task is to get a basic overview of what sources of electrical energy we have, so that students are not limited to sources that currently resonate in society.
3. Task: not only knowledge of the overview of sources, but also their properties, is important for students' critical thinking in connection with the relationship between the production of electricity and the impact on nature.
4. Task: the impact on nature does not always have to be only visible, e.g. smoke, but overall what kind of waste is produced by which source of electricity.
5. Task: excursion - possible implementation deepens theoretical knowledge and memorization of the subject matter through experience.

Methodology

- The organization is primarily dependent on the possibilities of using computer technology.
- The tasks themselves are designed for 2 x 45 minutes, depending on the time available, it is not necessary to complete all the tasks.
- Frontal teaching, group teaching, individual teaching, project teaching, teaching in pairs and guided discussion .
- Technical provision of teaching - for the purpose of finding information, it is necessary to use the Internet, it is possible to use a PC classroom, tablets with Internet connection, or pupils' phones.

Solving the tasks:

- Solving the tasks does not have a single specific result, the information searched is recorded in a table in the worksheet and students can further discuss the information. The purpose is to encourage critical thinking and the creation of the student's own opinion based on a constructive discussion.

Methodology – solving tasks

Solving the tasks:

- Solving the tasks does not have a single specific result, the information searched is recorded in a table in the worksheet and students can further discuss the information. The purpose is to encourage critical thinking and the creation of the student's own opinion based on a constructive discussion.

Example of searched information:

Sources of electricity	Types – write:	Advantages:	Disadvantages:
Renewable:	Water, wind, solar and biogas power plants. For Central Europe, atypical power plants are geothermal, surf, tidal, etc.	These are renewable resources that are basically inexhaustible and do not burden the environment, or at least etc.	They do not have the performance of traditional power plants, large financial costs for construction, they often take up a lot of space, spoil the landscape, etc.
Non-renewable:	Coal, gas, nuclear power plants.	High output, cheap electricity, easy regulation in the energy system, lower construction costs, except for nuclear power plants. Low operating costs. Apart from nuclear waste in small quantities, the nuclear power plant no longer produces any other by-products. It is an ecologically friendly resource.	They produce waste and pollute the environment.

Methodology – solving tasks

Example of searched information:

	Nuclear power plant:	Gas power plant:	Coal-fired power plant:
Waste	Spent nuclear fuel, highly radioactive. The amount of waste is in the order of tons per nuclear block.	Carbon dioxide.	Carbon dioxide, slag - the so-called ash, its amount is in the order of hundreds to thousands of tons per year.

Task methodology

- **Activity 1:** Individual contributions of students in class, the teacher gradually lets the students write their contributions on the board. The teacher helps the students with appropriate help. The teacher directs the students' debate.
- **Activity 2:** Individual contributions of pupils in the class, the teacher helps the pupils with appropriate help and manages the pupils' debate. Subsequently, he organizes individual drawing of a picture, with which the pupils can then decorate the classroom.
- **Activity 3:** The teacher lets the students individually write their contributions in the table. He helps students with appropriate help and supervises the appropriate writing of arguments in the table.
- **Activity 4:** The teacher lets the students individually write their contributions in the table. He helps students with appropriate help and supervises the appropriate writing of arguments in the table.
- **Activity 5:** Students find a suitable place for a thematic excursion through a guided discussion. The subsequent solution will take place according to the possibilities of the school.

Methodology – control question

Question: Which of the listed power plants has the least impact on the environment?

a) **nuclear power plant (correct answer)**
b) gas power plant
c) coal-fired power plant
d) I don't know

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3. Research in nature

Production of measuring containers for capturing rainfall, measuring rainfall

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Introduction to the topic

Water is a basic requirement for life on our planet. The significant deterioration of the land's ability **to retain rainwater** and climate change caused by humans in the form of uneven rainfall patterns with long dry periods and high rainfall in a short period of time are potentially the biggest environmental problems of our time, affecting the production and availability of food for a part of the world's population.

In the case of water, we are lucky that its molecules cannot leave the Earth's atmosphere. It is a closed system that is powered by energy coming from the Earth's outer system in the form of electromagnetic radiation from our nearest star, the Sun. It is called the **water cycle** and it includes the **evaporation of water** associated with capillary phenomena and photosynthesis taking place in plants, all meteorological phenomena including **wind, water condensation in clouds, rain and snowfall, storms, lightning,** etc. After hitting the Earth's surface, water then forms rivers, lakes and seas by gravity, penetrates the soil, where it is stored in limited quantities as groundwater, and reaches the roots of plants, which create organic matter from water, carbon dioxide and nutrients in the soil, as they are supplied with electromagnetic radiation from the sun.

However, there is one small catch. When humans reduce the **soil's ability to retain water** through intensive agriculture and change the landscape so that precipitation only quickly flows away through rivers into the oceans, plants are unable to obtain the amount of water necessary for the functioning of the biosphere from the water cycle, and otherwise life-giving sunlight mercilessly kills them. **Drought** gradually turns previously fertile land into an uninhabitable desert. According to current scientific knowledge, these processes are irreversible. Nevertheless, people are aware of the importance of water for their lives - retaining **rainwater for irrigation** was already practiced in ancient Babylon.

Concept

- The goal of the task is to consolidate knowledge about capturing rainfall and measuring the amount of rainfall, supplemented with knowledge about measuring air temperature and other environmental parameters.
- Understanding of individual concepts in weather forecasting.
- Practical production of a measuring container for capturing rainfall from residual plastic materials (recycling and reuse of PET bottles).
- Recording of measured values in the meteorological diary.
- Creation of tables and graphs of the time dependence of the amount of precipitation, calculation of precipitation totals for the selected period in the table editor.

Necessary material for production

Material:

- PET bottles
- Laths or other wooden pegs to ensure the stability of the rain gauge
- String

Necessary tools and production

Tools and aids:

- Oh, old scissors, knife.
- Ruler , tape measure, tape measure.
- A measuring cylinder, kitchen or laboratory scales.
- Permanent alcohol marker (black recommended).
- PC and spreadsheet calculator, even calculators are sufficient for simple calculations. It is possible to use tablets or mobile phones.
- Available tools:
  school measuring system with temperature sensor (thermistor or thermocouple), weight sensor.

Note: the number of tools used depends on the possibilities of the school.

Teaching organization

- The tasks themselves are designed for 2 x 45 minutes, depending on the time available, it is not necessary to complete all the tasks.
- For a basic introduction to the subject by the teacher, it is possible to use the frontal method.
- Furthermore, students ideally work in pairs.
- Independent student work is also possible, but it may not suit all students.
- Larger groups usually lead to inactivity of other group members.
- In the practical part, students work independently according to the work procedure.
- If there is enough time, it is advisable to end each part with a discussion:
  - Summary of the issue,
  - work evaluation,
  - product evaluation.

Tasks

1. He will reflect on the use and meaning of the term "rainfall".
2. Types of precipitation - explanation of individual concepts (students can search on the Internet).
3. Typical precipitation totals for different intensities of rain and snowfall.
4. Reflecting on the work process - the students will look at the work process and try to determine which categories the creation falls into from the point of view of waste management.
5. Production of a container for capturing and measuring the amount of precipitation from residual plastic materials (PET bottles).

Methodology

Activity 1: Individual contributions of pupils in the class, the teacher gradually lets the pupils write down their contributions on the board. The teacher helps the students with appropriate help. The teacher directs the students' debate.

Activity 2 : Explanation of individual concepts (students can search on the Internet). The teacher helps the students with appropriate help. The teacher directs the students' debate.

Activity 3 : Pupils will try to find the difference between the amount of precipitation of water and snow on the Internet, they will compare the amount of precipitation in the form of water and snow. They find out what the average total precipitation is in the individual months of the calendar year.

Activity 4 : Pupils independently read the instructions for making a rain gauge, they can ask questions and briefly discuss the practical implementation. At the same time, the students will find out where the waste from the rain gauge belongs when the product reaches its end of life.

Activity 5: For their own production, the teacher divides the students into suitable groups, ideally in pairs. Subsequently, he supervises the production and above all the safe handling of the knife.

Methodology – control question

Question: In what units is the amount of rainfall indicated?

a) liters per second

b) meters per second

c) **millimeters per hour (correct answer)**

d) I don't know

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4. Types of plastics

Different types of plastics and their properties

Game of tic-tac-toe

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Introduction to the topic

The processing **of residual plastic materials** is one of the key components in the waste recycling hierarchy. This is also related to the waste of other resources. For further processing of plastics, it is necessary to know their properties, which can be derived from the originally produced objects and at the same time according to their groups, i.e. it is necessary to know their **markings**.

The combination of recycling and **saving other resources** creates new interesting products that are applicable to activities and lead to versatile skills. Creating new products from residual (waste) materials demonstrates recycling in practice at an individual level with available resources.

However, a key factor that has a fundamental impact on plastic waste pollution is the reduction of the production of plastic products and packaging materials. Recycling and reuse of plastics need to be addressed only secondarily, due to the constantly growing amount of plastic waste, it is more important to reduce its amount within production.

Goals

- The goal of the task is to consolidate knowledge in the field of plastics recycling.
- Description of the different markings of plastic materials, including their different uses and properties.
- Practical testing of the use of residual plastic materials (recycling) in the creation of a simple game.

Tools and materials

Material

- Plastic lids 6 or more pcs.
- plastic bottle,
- colored/white paper or a quarter of A4 1pc,
- Euro foil 1 pc.

Tools and aids

- Worksheet,
- scissors ,
- black alcohol marker,
- crayons,
- markers or watercolors,
- folding knife.

Organization of Teaching

- For an introduction to the issue, it is possible to use the frontal method.
- It is followed by independent work (group work in pairs) of pupils in the theoretical part.
- In the practical part, students work independently according to the work procedure.
- If there is enough time, it is advisable to end each part with a discussion:
  - Summary of the issue,
  - work evaluation,
  - product evaluation.

Tasks

1. Labeling of plastics – pupils search (in groups or individually) for different labels of plastics in their surroundings (or on the Internet).
2. Plastic recycling – students search the internet for specific products, products and materials made from recycled plastic in the context of the original material.
3. Reflection - pupils think about the possibility of using residual plastic materials within their own possibilities of using them.
4. Practical part - in the practical part, students create their own game of tic-tac-toe from leftover plastic materials (plastic lids and a bottle).

Methodological guidelines

Pupils in the theoretical part

- They repeat the issue *of recycling* in the context of material reuse and saving other resources
- They will repeat the issue *of recycling* numbers

In the practical part, using lids, Eurofoils and drawing aids, they will create their own game of tic-tac-toe.

Both parts should be followed by a discussion:

- Summary and significance of the issue and control of worksheets
- Product demonstration

Methodological guidelines

- The time estimate for the activity is 45 minutes.
- The theoretical part is 15 minutes and the practical part is the rest of the hour.
- The time required to create the game Tic-tac-toe may vary in relation to:
  - with the selected creation difficulty,
  - the length of the introduction and discussion,
  - on the skills and abilities and creativity of pupils.
- Work safety when handling sharp tools is also important here.
- For teaching, including control and discussion, I recommend two teaching hours.

Methodological guidelines

- In the theoretical part, it is not so important that the students answer everything correctly, but that they become familiar with the given labels and concepts. It is also important that they try to be creatively involved in coming up with possible types of other possible products.
- At the same time, students should be aware of the essence of the activities, both in the theoretical part and also in the practical part. Because it is not only about recycling, but also about preserving other resources that are normally used and wasted during creation, specifically paper.
- Plastic marking solution: 1 PET (PETE) Polyethylene terephthalate / 2 HDPE (PE - HD) High density polyethylene / 3 PVC (V) Polyvinyl chloride / 4 LDPE (PE - LD) Low density polyethylene / 5 PP Polypropylene / 6 PS Polystyrene / 7 - 19 Other plastics, e.g. polycarbonate (PK), polyamide (PA), acrylonitrile butadiene styrene (ABS), styrene-acrylonitrile (SAN), bioplastics.

Methodological guidelines

- In the work process, we can also skip the paper itself and draw a square grid directly on the foil, in this procedure I recommend using a permanent marker and a harder foil . When using drawing aids, higher quality alcohol markers are more suitable, ideally permanent.
- At the same time, the creation of figurines is left to the students' creativity.
  - The simplest possible principle is indicated in the workflow.
  - Pupils can easily improve the figures and the square grid according to their own discretion.
- The activity is therefore modified in such a way that even weaker students can handle it, and the more capable ones can adjust it according to their own needs.
- The advantage of the activity lies in its simplicity and the possibility of various modifications using other possible materials. Based on this chosen principle, several games of a similar type for multiple players can be produced. For example, Man, don't be angry, Checkers or Chess.

Topic no. 4: What material loses its key properties during recycling and can only be recycled to a limited extent?

a) Glass
b) Iron
c) Plastic
d) I don't know

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5. How to protect the environment

Environmental protection activities at the individual level

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Introduction to the topic

Man naturally shapes the world around him through his behaviour, and thus shapes the environment of his kind. This includes the construction and operation of human dwellings, the production of food, clothing and other goods, transport infrastructure and everything that contributes to a comfortable life.

However, in the long term, it turns out to be unsustainable to simply and thoughtlessly draw on fundamentally limited natural resources, which after rapid consumption turn into waste, and during the production and transportation of new and new goods, often very toxic emissions are released into the air.

For now, existing generations are only passing this urgent problem on to future generations, and with the accelerating pace of consumption, the time when available natural resources will be sufficient to maintain the lifestyle we have become accustomed to is constantly shortening.

Concept

- The goal of the task is to consolidate knowledge about the impact of each individual on the environment, supplemented by knowledge about the energy requirements for transporting people, households, etc. also knowledge about direct recycling of packaging material.
- The student can name the fundamental ecological problems of the present, understands the influence of his behavior and decision-making in the context of the environment.
- Can find the necessary information on the Internet about the impact of waste on the environment, waste disposal and other uses of waste.
- He understands the connection between energy and its impact on the environment, especially in the production of electricity.
- He can calculate the energy consumption of household appliances and can interpret them with respect to the environment.

Necessary material for production

- Waste materials according to specific activity - e.g. worn bicycle tires.
- Glue for paper, glue for leather and rubber.

Necessary tools for production

Tools and aids:

- Printer, DIN A4 size paper sheets, large format wrapping paper or DIN A0/A1 sheets
- Writing supplies
- Scales
- Cutting pliers
- Sharp knife
- Sheet metal shears
- PC and spreadsheet calculator, even calculators are sufficient for simple calculations. It is possible to use tablets or mobile phones

Note: the number of tools used depends on the possibilities of the school

Methodology

- The tasks themselves are designed for 4 x 45 minutes, depending on the time available it is not necessary to complete all the tasks.
- For an introduction to the issue, it is possible to use the frontal method.
- It is followed by independent work (group work in pairs) of pupils in the theoretical part.
- In the practical part, students work independently according to the work procedure.
- If there is enough time, it is advisable to end each part with a discussion:
  - Summary of the issue.
  - Evaluation of work.
  - Product evaluation.

Tasks

1. Reflection on the use and meaning of the terms "local food, direct recycling, household energy requirements".
2. Explanation of individual concepts (students can search on the Internet).
3. Mapping the types of packaging for various foods, materials for the production of packaging, determining the weight of the packaging in relation to the weight of the contents.
4. Determining the shelf life of food in given packaging, storage and the method of transporting goods, including distances.
5. Keeping a waste log keeping track of the types, quantity and weight of sorted packaging in pupils' homes.
6. Shoe sole repair project using a piece of rubber obtained from a worn bicycle tire.
7. School exchange and flea market for direct recycling of unused items.
8. Calculation of household energy requirements, detection and measurement of electrical power consumption of appliances in the household
9. Calculation of consumption of a family car and comparison of energy requirements for individual transport with means of mass transport.

Task methodology

Activity 1: Individual contributions of students in class, the teacher gradually lets the students write their contributions on the board. The teacher helps the students with appropriate help. The teacher directs the students' debate.

Activity 2: Pupils can look up the meaning of individual terms on the Internet. Depending on the possibilities of the school, you can work independently, in pairs, or students can use their phones.

Activity 3 : Pupils find out the properties of used packaging materials. They can get information on the Internet. Depending on the possibilities of the school, you can work independently, in pairs, or students can use their phones.

Activity 4 : Pupils find out the durability of food in the context of different types of packaging materials, storage and transport. They can get information on the Internet. Depending on the possibilities of the school, you can work independently, in pairs, or students can use their phones.

Activity 5 : As part of homework, students can record the waste produced in the household. They record the types and classification of waste in an appropriate manner. They can use paper and pencil, but you can also use the electronic method, computer, telephone.

Task methodology

Activity 6: For implementation, it is necessary to prepare suitable material and glue. The actual implementation will take place in the school workshop, ideally in pairs.

Activity 7 : Pupils can try to implement a school exchange, where, for example, by donating or exchanging old and unnecessary things, they can be given a "second chance" to reuse them.

Activity 8 : Pupils can search on the Internet what the power consumption of a device means and can compare individual appliances with each other with regard to their efficiency. Depending on the possibilities of the school, you can work independently, in pairs, or students can use their phones.

Activity 9: Pupils will find technical data on the consumption of a car and calculate how much fuel will be needed - as a result, how much and what financial costs they will need for such a trip. They will proceed in the same way when realizing the same journey by mass means. They will use the Internet to find the necessary information. Depending on the possibilities of the school, you can work independently, in pairs, or students can use their phones.

Methodology – control question

Question: What waste material can be used to repair shoes?

a) impregnated paper carton

b) **a worn bicycle tire (correct answer)**

c) an empty PET beverage bottle

d) I don't know

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6. Sorting and recycling

Waste treatment

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Introduction to the topic

- **Waste can be classified** according to various criteria: origin, composition, degree of hazard, etc.
- For the purposes of this project, we will be interested in the division according to the possibility of recovery.
- Recycling waste materials should be part of our daily routine. **Waste management** is a matter that can be influenced by the behaviour of each individual.
- According to data for 2021, for example, one Slovak/Czech produces more than half a ton of municipal waste per year.
- It is necessary to spread awareness about proper waste management and adopt the **3R rule (Reuse, Refuse, Recycle**), which aims to reduce the amount of **municipal waste**.
- Reuse (reuse) – use what can be reused and do not buy new.
- Refuse (let's learn to refuse) – let's not be tempted to buy things that are unnecessary or inappropriately packaged.
- Recycle (let's recycle) – let's recycle and sort correctly.
- In the modern world, there is an emphasis **on minimalism and upcycling**. Upcycling is the process of reusing unused products or waste materials and finding a new use. It is often a design-based art. Especially in the case of light metals (cans, preserves), this trend is welcome and there are many tips for making decorations and practical home or garden accessories.

Objectives:

The student can:

- understand the concepts of recycling, upcycling, minimalism, waste materials;
- understand English terminology and the abbreviation RRR (3R,4R);
- discuss the importance of sorting and the importance of individual decisions;
- monitor your surroundings, recognize and sort waste materials;
- argue and look for solutions;
- promote the importance of waste reduction and recycling.

Teaching organization:

- In the introductory discussion, the students divide the waste according to different criteria, the teacher can mention the new valid laws.
  - *for the Czech Republic: on 1 January 2021, a number of laws came into force that focus on the future of waste management. The intention is to gradually increase fees for landfilling until it is completely eradicated by 2030. The goal is to sort more and after 2035 recycle 65%, use 25% energetically and export a maximum of 10% of the total municipal volume to landfills.*
- The questionnaire about the situation in the neighborhood is suitable to be done online or by swapping roles, when 3 students will be the teachers
  - one will read the questions, 2nd count the votes, 3rd record the votes (on the PC)
  - pupils manage the discussion, the teacher can vote as a pupil, at the end the pupils present statistics
- In addition to activities on the given topic, we recommend continuing with a project month that focuses on cross-subject relationships.
- The game Minimalista needs to be properly presented and supported by controlled argumentation. Support both teams so that they want to discuss and leave space to defend themselves.

Activities to choose from:

- The chapter offers activities to choose from so that they can be combined within 45 or 60 minutes.
- **My fridge** (theoretical part with home preparation: 10-15 min)
- **I sort, you sort, you sort** - discussion + game (theoretical part 10 min; questionnaire (10 min)
- **A month in a basket** (practical part full of various activities supporting cross-curricular relationships (optional long-term projects)
- **Minimalist** (game, 15 min, excellent practice of argumentation and discussion management)

Tools and materials:

- for warm-up activity: photos of a refrigerator with contents, crayons
- for the practical part, we will use materials according to the individual activities, it depends on the choices of the project
- the other activities are without aids, they only use the specified waste materials

Methodical instructions - my refrigerator

- Time estimated for the activity is 10-15 minutes, suitable home preparation.
- We recommend sharing refrigerators anonymously, e.g. on the class portal or the pupils show each other, so that as many pupils as possible join in the discussion in small groups or pairs, while the teacher goes through and corrects opinions, or helps to resolve disagreements.
- It is necessary to draw attention to the whole range of waste containers and mention that their color may differ in different countries (see England green for organic waste, while the Czech Republic for colored glass, in Italy they have a yellow container for paper, cardboard or pizza boxes...).
- Therefore, it is good to follow the labels on the containers.
- The activity can also be nicely connected with a sample map showing the location of waste containers in your neighborhood (see chapter 7, part brainstorming).

Methodical instructions - the moon in the basket

- In the methodological manual, you will find tips on project-type activities and their possibilities for inclusion in other subjects.
  - month in the paper bin (support for cooperation and school-wide organization)
  - month for sheet metal (interdisciplinary focus on HV, FYZ, TV, recycling, upcycling)
  - month in plastic (topic: fashion, upcycling, sustainability)
  - a month in decomposition (reference to chapter 7, making a composter from a pet bottle)
- We constantly emphasize the 3R rule and its English counterparts:
  - Refuse / Reduce (not only to reduce, but to refuse the production of waste)
  - Reuse
  - Recycle

Topic 6: Waste management works with the so-called by the 3R rule (Refuse, Reuse, Recycle). What is the primary goal of man?

a) sort waste
b) recycle waste
c) not to produce waste
d) I don't know

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Project Agreement Number: **2022-1-SK01-KA220-SCH-000085417**

7. Biowaste

Simple composter

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Introduction to the topic

Biowaste is an abbreviation for **biodegradable waste**. It is organic waste from households or gardens. Biowaste makes up approximately 40% of all waste by weight and often ends up in municipal waste instead of the brown bins that are intended for it.

From the perspective of a circular economy, biowaste is a very promising material that could be used as fertilizer or even a source of energy (e.g. electricity, gas). However, we must first focus on its proper sorting and composting.

Biowaste can be composted in a **vermicomposter** using earthworms, in a regular garden compost pile or in a shared compost pile with neighbours. These places and brown bins are always a better choice than municipal waste, incinerators or landfills, which produce greenhouse gases due to the lack of air.

Objectives:

The student can:

- understand the concepts of compost, recycling, etc.;
- understand English terminology and the abbreviation RRR;
- discuss the importance of sorting biowaste, reducing its generation and recycling;
- monitor your surroundings, recognize containers for sorting and bio-waste at home and at school;
- upcycling a PET bottle and using it to create simple biocompost.

Teaching organization:

- In the introductory part, students will review the issue of waste sorting (see chapter 6) and focus on bio-waste. They will become aware of the lack/availability of containers in the immediate vicinity and discuss how and what kind of organic waste they sort, if at all.
- In the practical part, in groups (ideally in pairs), they will try to create simple, homemade compost from commonly available recyclable materials.
- The students will ideally take the created product home.
- After about a month, they will recapitulate the topic and evaluate if the composts work, how they look, if they smell and how we can further use the material.

Activities to choose from:

The chapter offers activities to choose from so that the total subsidy does not exceed the duration of two 45-minute lessons.

- Bio-waste and its sorting (theoretical part: 15 min)
- Brainstorming - biowaste here and now (30 min)
- Production of a simple composter (practical part: 30 min)
  - We recommend including the activity, the entire chapter 7 is based on it.
- Cross-curricular activities (optional, approx. 15 min each)

Methodological guidelines

- The introduction and conclusion should summarize important knowledge regarding biowaste, and after mutual cooperation, the students should have a composter in their hand and points to remember in their head.
- However, the main goal is not only to raise their awareness of how bio-waste is sorted, but to actively encourage them to know and use the nearest brown containers in the places where they move.
- If there is space available on the school property, the students would ideally build a larger composter for organic waste.

Methodological instructions - activity 1 quiz

- The time estimate for the activity is 15 minutes.
- We recommend using a playful method to get as many students as possible involved at once (Kahoot or Wordwall race - students start it on their mobile device via a QR code), or make it like a classic paper questionnaire and emphasize that this was not exactly ecological:)
- **Correct answers:**
  - 1) brown (in SK, but in other countries it can also be green)
  - 2) 40%
  - 3) 1/3
  - 4) do not produce waste
  - 5) earthworms (other types of decomposers: centipedes, nematodes, mites, roundworms, pinworms, etc.)
  - 6) methane

The introduction to the topic can be done head-on at the beginning or right at the end and summarize the information from the activity.

Methodical instructions - activity 3 composter

- The time estimate for the activity is 30 minutes, work in pairs/groups.
- We recommend inter-subject linking with English and showing a video, or showing an already finished sample of the product.
  - here is the QR code for the video

- It is advisable to project the procedure head-on or let them use a mobile device with a video that they can pause.
- During production, there is a controlled discussion about what belongs/doesn't belong in the bottle.
  - You can ask about egg shells, for example. These can be stored in the home biocompost, but do not belong in the biowaste bin due to operating regulations. It is waste of animal origin.
  - We constantly emphasize the advantages of a home composter (remember).

Tools and material for pairs/groups:

- plastic bottle (two-liter Coca-Cola type is ideal)
- scissors or a retractable break-off knife
- aluminum foil (larger diameter than the diameter of the bottle body)
- sharp pencil or skewer
- pot with soil
- earth scooping container
- organic waste in a cup or other container (snack peels, leaves, etc.)
- tool for scooping up waste
- sprayer with water and newspaper (one per class is enough).

Methodological instructions - cross-curricular activities

- Here is a list of suggested cross-curricular activities, each approx. 15 min.
- Art lesson: description of images in pairs, groups, possible creation using AI
  - the works of G. Arcimboldo or J. Švangmajer
  - password food art
- English lesson: vocabulary work, own presentations
  - suitable activity What does not belong in bio/waste (worksheet or Wordwall)
- Math: on the website https://co2.myclimate.org/en/calculate_emissions, choose calculate consumption, and compare (with each other, average, percentage, frequency...)
- Chemistry: project on Greenhouse gases (Kyoto protocol, greenhouse effect)

Topic 7: In landfills, part of the waste decomposes and rots due to the action of microorganisms without access to air. What greenhouse gas is released?

a) ethane
b) methane
c) ozone
d) I don't know

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Project Agreement Number : **2022-1-SK01-KA220-SCH-000085417**

8. Waste hierarchy

Recycling and reuse

Yo-yo from lids

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Introduction to the topic

The waste hierarchy is a key aspect of waste management. If its principles are followed, it will lead to a reduction in the total waste production in society.

Creating new products from waste materials then demonstrates the practical use of **recycling** at the individual level.

Goals

- The aim of the task is to consolidate knowledge in the area of waste hierarchy, recycling and reuse of plastic materials.
- Understanding of individual terms also in English.
- Practical testing of the use of residual plastic materials (recycling and reuse) when creating your own Jojo.

Tools and materials

Material

- Plastic caps 2pcs,
- skewers 1 pc,
- cotton,
- wooden beads 2pcs,
- colored paper or quarter 1 pc.

What you need

- Hot melt gun,
- scissors,
- nail scissors.

Organization of Teaching

- For an introduction to the issue, it is possible to use the frontal method.
- It is followed by independent work (group work in pairs) of pupils in the theoretical part.
- In the practical part, students work independently according to the work procedure.
- If there is enough time, it is advisable to end each part with a discussion:
  - Summary of the issue,
  - work evaluation,
  - product evaluation.

Tasks

1. The concept of waste hierarchy - thinking about the concept, searching for its explanation.
2. Waste hierarchy pyramid - ranking of the pyramid of concepts in AJ.
3. Explanation of individual concepts - students discuss individual concepts in pairs. If they do not know them, they can look them up on the Internet.
4. Reflecting on the work process - the students will look at the work process and try to determine which categories Jojo's creation falls into in terms of waste management.
5. Making Jojo - in the practical part, students create their own toy from leftover plastic materials (plastic lids).

Methodological guidelines

- In the theoretical part, students will remember the issue of the waste hierarchy with terminology in English and explain the individual principles.
  - it is an international issue, the terms must be known in English

    - cross-curricular connection with English (only SK, CZ, BG versions)
- In the practical part, you will create your own yo-yo using a melt gun and plastic lids.
- After creating the product, it is appropriate for the students to show the yo-yo to each other, and as part of the demonstration, it is appropriate to discuss with the students the importance of recycling and other possible products from residual plastic materials.

Methodological guidelines

- At the end of the activity, it is advisable to have a discussion with the pupils on the topic:
  - recycling and reuse,
  - checking worksheets,
  - product demonstration.

Methodological guidelines

- In the theoretical part, the exact translation is not important, but rather the meaning of the terms.
- If students have not yet encountered the topic of waste management (waste hierarchy):
  - You can tell the students that the term refers to a picture of a pyramid.
  - Pupils can process worksheets in pairs or groups.
  - You can also enable students to use the Internet, etc.
- In the pyramid, only the order is important, so there are two possible solutions (according to the meaning of understanding the base and the tip of the pyramid)
  - Prevention > Reduce > Reuse > Recycle > Recovery > Dispose

Methodological guidelines

- In order to complete the theoretical part, it is necessary that the students already have a workflow with pictures available.
- In the workflow, you can use, for example, a nail or other workshop equipment instead of nail scissors in point 2.
  - Pay extra attention to work safety in this step.
- In point 11 to 14 (creation of blanks) it is a visual rendering, this part can be skipped.
- When using plugs, it is necessary to use some additional load for the proper functioning of Jojo.
- The workflow uses a wooden bead, but any substitute that adds weight to the Jojo should work, such as a piece of cork plug, screw washer, nut, etc.

Methodological guidelines

- At the end of the activity, it is advisable to have a discussion with the pupils on the topic:
  - recycling and reuse,
  - checking worksheets,
  - product demonstration.

Topic no. 8: What is the most important (most important) for reducing the pollution of nature with plastic waste?

a) recycling of plastics
b) reduction of production of plastics
c) reuse of plastics
d) I don't know

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9. Business from the point of view of ecology

Business world map

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Introduction to the topic

Due to current trends, there is increasing pressure on **ecological entrepreneurship** – the so-called green entrepreneurship. This applies mainly to Europe, North America and some Asian countries. This type of entrepreneurship aims to create a concept of ideally zero environmental impact. Green entrepreneurship also includes social impacts in its concept, thereby trying to contribute to economic and social development in the world.

There are several ways to examine the environmental performance of countries around the world, and thus identify countries that have the greatest, but also the smallest, environmental problems in business. However, it is important to be aware of the crisis situation in some countries and its subsequent impact on the environment.

The aim of the following activities is to clarify the meaning of ecological entrepreneurship and at the same time familiarize students with real data.

Objectives:

The student can:

- Critically decide on the ecological plan of different countries, or continents
- Find answers to critical questions on the topic on the Internet
- Describe the customs and ecological thinking of individual continents
- Present your created project
- Cooperate with your classmates

Tools and materials:

Tools:

- Pens
- Computer
- Markers
- Colors

Material:

- Paper
- Worksheet
- Printed maps of the continents

Teaching organization:

- For an introduction to the topic, it is possible to use face-to-face teaching
- Then it is appropriate to divide the pupils into 6 groups and give them questions from the given continents separately
- Pupils answer the given questions as an independent work using computers
- Subsequently, the students join into groups according to the continents and discuss their answers
- Finally, they present their results to the rest of the class
- If there is time left in class, it is advisable to end the topic with a joint discussion

Tasks:

- Introduction to the topic - students will get to know the concept of business in the world from the point of view of ecology
- Answers to questions - pupils will answer assigned questions independently, using the internet as a resource
- Group work - students divided into groups according to the given continents will discuss what they learned on the Internet
- Presentation – students present their results in groups in front of the class

Methodological guidelines

- In the theoretical part, students will review the issue of business from the point of view of ecology and individually answer critical questions dealing with this topic.
- In the practical part, the group will create a map of the world divided into given continents, which will show the ideas from the theoretical part.
- During the practical part, it is advisable for students to present their results in front of the rest of the class. Subsequently, the class can discuss this issue in more depth.

Methodological guidelines

- The time estimate for the work is 40 minutes, if we neglect the home preparation.
- The theoretical part should take a maximum of 30 minutes at home.
  - The time required to create a continent may vary depending on the chosen difficulty and the age of the students.
  - Furthermore, it will also depend on the creativity and ability of the students, or even their innovation.
- It is important that the pupils cooperate.
- It is advisable for the students to draw lots and not choose the given continents.
- At the end, it is appropriate to hold a discussion on the given topic.

Methodological guidelines

- In the theoretical part, it is not so important that the students answer everything correctly, but that they are able to think critically about ecological business and check the information. A suitable method for consulting the acquired knowledge from activity one is group discussion.
- It is very important that the pupils are aware of the essence of the activities, both in the theoretical and the practical part, as it is not only a look at the individual problems of the continents, but also the world's thinking about ecology as such and also the influence of man on the environment.
- The solution to partial worksheets is very individual and there is not always one correct answer.
- The workflow can be adjusted in several ways.
  - If there is enough time, students can complete the theoretical part on school computers/tablets.
  - In the same way, each group can draw the entire continent on its own in a predetermined scale.
  - If, on the other hand, there are a small number of students in the class, or there is not so much time available, the teacher can completely omit some partial worksheets.

Topic 9.: What are the so-called "green economy"?

a) Stop using heavy machinery and go back to the Middle Ages

b) Change the recycling policy by making waste sorting legal

c) Transform the amount of waste into a new source of energy

d) Transform the current linear economy into a circular one and thereby reduce the amount of waste

e) I don´t know

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10. The relationship between nature and civilization

Wild animals living around cities, hunting, forestry, how to behave in the forest

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Introduction to the topic

When walking in nature, you will definitely notice wildlife. You can meet **many species** here, the most famous of which is probably the red deer, but also the European red deer, the red fox, the red wolf, the wild boar and many other species. Last but not least, the brown bear can be dangerous for us humans.

- Wild animals are shy, they usually avoid all people.
- If we behave more quietly in nature, we can see some species, usually in pastures.
- We come across traces of game much more often, mostly **footprints** on the ground.
- In spring, we can also see young animals, most often deer.

Wild animals can therefore be seen not only in zoos, but also in the wild if we behave quietly.

Wild animals usually do not have a natural enemy in the form of predators, so it is necessary to regulate their numbers. For this purpose, we have hunters who regulate the numbers of wild game through controlled hunting.

Humans also significantly influence the natural food structure that wild animals can find in nature. For this reason, some species of animals need to be fed, especially in the winter months.

Goals

- The aim of the tasks is to get an overview of wild animals in our surroundings.
- All animals may not be visible at first glance, but they still live in our surroundings.
- Pupils will get a basic idea of how to behave in nature.

Game species

- Pupils get at least a basic idea of how to identify individual animals.
- They can identify animals visually.
- He can identify animal tracks on the ground, in the snow, etc.
- Pupils will get an idea of how to feed animals in times of need.

Teaching organization

- For a basic introduction to the subject by the teacher, it is possible to use the frontal method.
- Furthermore, students ideally work in pairs.
- Independent student work is also possible, but it may not suit all students.
- Larger groups usually lead to inactivity of other group members.
- The students' mutual discussion leads to a deepening of critical thinking, the ability to communicate, formulate ideas and present.

Tasks

1. **Task**: students can name the animals they saw in the zoo. Furthermore, they can identify animals that live here in the wild and which are rather foreign.
2. **Task**: students can name the wild game species in our environment based on their appearance.
3. **Task**: students can match their tracks to individual species of animals.
4. **Task**: students can determine what to supplement the natural diet of animals, especially in times of hardship - winter.
5. **Task**: excursion - possible implementation deepens theoretical knowledge and memorization of the subject matter through experience.

Methodology

- The organization is primarily dependent on the possibilities of using computer technology.
- The tasks themselves are designed for 2 x 45 minutes, depending on the time available, it is not necessary to complete all the tasks.
- Frontal teaching, group teaching, individual teaching, project teaching, teaching in pairs and guided discussion.
- Technical provision of teaching - for the purpose of finding information, it is necessary to use the Internet, it is possible to use a PC classroom, tablets with Internet connection, or pupils' phones.

Methodology – solving tasks

1. **Task**: students can name the animals they saw in the zoo. Furthermore, they can identify animals that live here in the wild and which are rather foreign.

2. **Task**: students can name the wild game species in our environment based on their appearance.

3. **Task**: students can match their tracks to individual species of animals.

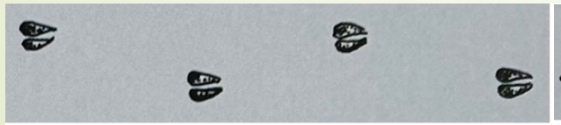
The solution to tasks 2 and 3 is in the following pictures:

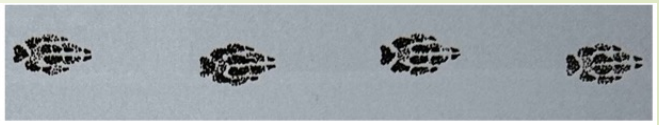
Mouflon

Roe deer

Wood badger

Red fox





Methodology – solving tasks

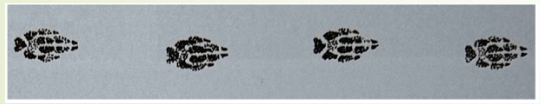
Eurasian lynx

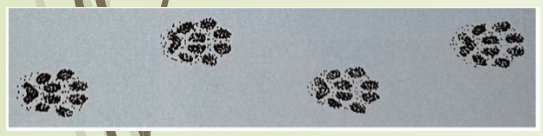
Grey wolf

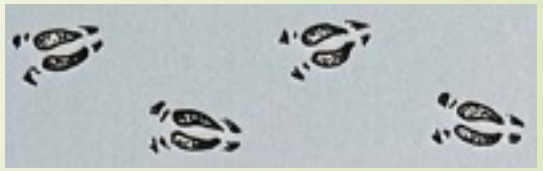
Brown bear

Common pheasant

Wild boar







Methodology – solving tasks

4. **Task:** students can determine what to supplement the natural diet of animals, especially in times of hardship - winter.

- fodder for feeding animals in autumn is pulpy fodder - fodder carrots, beets and the like (until the first frosts). In the winter months, there is mainly bulk fodder - hay. Towards the end of winter, it is possible to use core fodder - oats or barley. During the whole winter, mineral lye - salt is added.

5. **Task**: field trip - possible realization deepens theoretical knowledge and memorization of the subject through experience.

- it is possible to go to the forest, plan a school trip, or visit a specialized breeding farm with a professional explanation.

Methodology – solving tasks

- **Activity 1:** Individual contributions of students in class, the teacher gradually lets the students write their contributions on the board. The teacher helps the students with appropriate help. The teacher directs the students' debate.
- **Activity 2:** Pupils individually write down the names of individual species for the given pictures. The teacher continuously checks the correctness, depending on the situation, he can help the students with identification and the correct name. The goal is to correctly identify the name and appearance.
- **Activity 3:** Pupils individually connect pictures of tracks and pictures of animals with a pencil (in case of correction). The teacher continuously checks the correctness, depending on the situation, he can help the students with identification and the correct name. The goal is to correctly connect the image of the game and the track.
- **Activity 4:** The teacher lets the students individually write their contributions in the table. He helps the students with appropriate help and supervises the appropriate recording of the types of feed in the table.
- **Activity 5:** The length of the walk and its organization depends on the disposition of the school. The teacher can plan the event himself, the time range will be 2 x 45 min.

Methodology – control question

Question: What does the term track mean?

a) **instead of a footprint of a game in soft soil, possibly snow (correct answer)**
b) regular resting place for animals
c) instead of the taste of young trees
d) I don't know

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Projekt: **Innovative STEPS** (Innovative SusTainability Education for Prosperous Schools)
ID číslo projektu : 2022-1-SK01-KA220-SCH-000085417

Methods and organizational forms of teaching

Teacher´s Training

Author: Mgr. Martina Klieštiková

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Teaching methods are among the basic elements of teaching.

In teaching, there is constant ***interaction between the teacher and the student*** or ***between the students themselves.*** The interaction between the teacher and the student is realized through teaching methods .

It is up to the teacher to choose the most appropriate teaching method to make the subject matter accessible. In the past, classical teaching methods such as explanation or lecture were mainly used.

Today, teachers use many non-traditional teaching methods that involve students in the process of explaining the subject matter, independent work and problem solving.

These methods support students' development of analytical, logical and creative thinking, independence and social understanding of others.

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Organizational forms of teaching represent organized activities of students and teachers that take place in a certain time, space, and according to a plan.

Classification of organizational forms of teaching :

a) by environment:

- classroom teaching
- teaching in specialized school facilities (computer lab, laboratory)
- teaching outside the classroom (e.g. in nature, in a muse...)

b) according to the number of students

- frontal teaching (the whole class learns at the same time)
- group lessons
- individual tuition

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Project: Innovative STEPS **(Innovative Sustainability Education for Prosperous School**
Project Agreement Number : 2022-1-SK01-KA220-SCH-000085417

Group work

The importance of group teaching is that students solve common tasks and problems, exchange opinions, complement each other, help each other, are jointly responsible for the results of their work , etc.

Ukazovateľom efektívnosti skupinovej práce nie sú výsledky skupín, ale výsledky jednotlivcov.

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Advantages and disadvantages of group teaching

Advantages	Disadvantages
Increasing interest in the subject, learning	Time required to prepare a lesson
Active learning of the curriculum	Classroom noise
Responsibility for group activities /for one's own work	With a large number of groups, the teacher may lose track of their activities.
They learn to plan their work/use time efficiently	Uneven number of students in a group when students are absent from class
Respect for other group members	Refusal of the activity in case of poor student distribution (I am not in a group with a friend)

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The ideal number of students in a group is 4.

Group types :

- Natural groups – voluntary selection of students
- Familiarization groups – getting to know new students
- Short-term groups – most often used for short activities
- Long-term groups – for long-term work, effective
- Homogeneous – if the teacher needs to work with a group of certain students
- Heterogeneous – students with different levels of task m

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How to create student groups :

HOW NOT!!! Dividing groups according to friendship creates space for conflict and injustice towards excluded classmates .

HOW YES!!! Random division: we encourage students to take this as a challenge for the future, when in their jobs they will need the ability to get along with different people. The class provides a safe environment where they can practice this.

Examples of random division

- Pens – students put their pens in a cup – pens are randomly drawn and form groups
- Names – tickets with the names of the students that we draw
- Puzzle – we cut the picture into parts, students draw lots and look for who they can put the picture together with
- Heroes – we give pictures of movie or fairy tale heroes to the students and they then look for their group of characters from the movie/fairy tale (we can use various variations: names of famous people, pictures, geometric shapes, songs, years and events, etc.)

Tip: make raffle tickets that you will use all year round

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Comparison of group and cooperative learning

Group lessons	Cooperative teaching
Social skills are not considered	Targeted development of social skills
The teacher does not interfere with group work	The teacher observes the work and intervenes if necessary
The main activity is led by the teacher or a selected student	Joint leadership of the activity by all students
The student is responsible only for himself/herself.	Responsibility for the entire group

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Examples of group and cooperative learning techniques

- Controlled discussion
- Step-by-step discussion
- Buzzing groups
- Snowball
- Crossed groups
- Mind map
- Jigsaw/Puzzle or Circle of Experts
- Aquarium

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Project-based learning is a teaching method in which we can use some teaching methods such as problem-based learning, cooperative learning, group learning, and discussion.

The aim of project-based teaching is **to actively involve students in the learning process.** The teacher prepares problem tasks that lead students to think about what they are learning. The implementation and outcome of the project depends on the students' creativity, imagination, critical thinking and motivation.

The essence of project-based teaching is **the solution of an emerging or raised problem by students in the form of a specific project** .

The principle of project-based teaching is **to take into account the needs and interests of children.** The choice of topic should contribute to the self-realization of students, allow them to gain new experiences and a perspective on the current situation - to connect school with life. **Interdisciplinarity is also important** , which means going beyond the framework of individual subjects. Self-regulation in project-based teaching helps students learn to plan, implement and evaluate their projects.

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Role play is a situation where a solution is implemented through role-playing. We use it to practice communication and social skills when we want students to experience different situations and see them from multiple perspectives. Role-playing helps students express their own opinions, attitudes and thoughts. They will see the consequences of their actions on others or discover the diversity of opinions and attitudes.

The essence of role-playing is playing a story, a situation. The story can be invented or created based on some template. It is essential that the story has its own gradation, educational potential and appeal to the students in the class.

Role-playing, due to the significant psychological burden on the participating students, requires very competent guidance from the teacher.

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Role-playing usually takes place in these phases:

a) familiarization with the situation

b) division of roles

c) preparation and practice

d) role-playing the situation by the group

e) evaluation and assessment of the conclusions from the game played

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Project: Innovative STEPS **(Innovative Sustainability Education for Prosperous School**
Project Agreement Number: **2022-1-SK01-KA220-SCH-000085417**

Inquiry-based teaching

IBSE- Inquiry based science education - vyučovanie založené na badaní.
Inquiry-based teaching is not a specific teaching method but contains elements of several teaching methods, e.g. problem-based teaching, project-based teaching. In inquiry-based teaching, the teacher does not present ready-made knowledge and acts only as an advisor/guide to the students in their activities. The student acquires knowledge through his own research, is independent in his work, carries out his own experiments and searches for information. If the student is to understand the natural sciences, he must understand the way scientists think and have the opportunity for independent active research and experimentation. The student becomes a researcher and author of new knowledge. Observation is a common activity of every human being. A person constantly observes a number of objects, phenomena and processes in their environment. Based on observations, scientists ask questions ("research" questions) to which they seek answers. In the search for answers, they establish hypotheses and plan experiments to confirm or refute their hypotheses.

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Types of inquiry-based teaching :

- ***Confirmation inquiry*** – students know in advance the result of the experiment, as well as the question and method by which they will arrive at the answer (result).
- ***Structured inquiry*** – students work independently to draw conclusions from the collected data, the basic question and procedure are presented by the teacher.
- ***Guided inquiry*** – the teacher only poses questions to the students
- ***Open inquiry*** – the highest form of research, which includes both the formulation of questions and the design of an experiment, data collection, analysis, interpretation and communication of results

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Advice for teachers on how to implement inquiry-based teaching:

- Thorough preparation before the lesson is important .
- Don't set tasks that are too difficult at the beginning.
- Each student should have their own research journal.
- Consider working in groups.
- Be careful not to interfere with students' research.
- Inform students that they will be assessed for the entire work, not just the result.
- Constantly remind them that every answer they find is valuable, regardless of its correctness.
- Provide assistance to students outside of class.
- Write down your observations from your research activities.
- Dedicate sufficient time to presenting student results.

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Procedure for inquiry-based teaching

In inquiry-based teaching, the student is placed in the position of a researcher and author of new knowledge. The discovery of new information is the basis of the student's work.

When conducting inquiry-based teaching, it is important to follow the following procedure:

a) **Asking questions** : raising an interesting question. We ask students questions without expecting an answer, or students ask questions of the teacher.

b) **Choosing a research question** : Students will choose a question to which they will seek answers.

c) **Formulation of a hypothesis** (first together with the teacher, later independently): Students try to think about and create their own hypothesis - a hypothesis for the answer to the question asked.

d) **Experiment:** finding answers to questions, confirming or disproving a hypothesis based on information obtained from the Internet or professional literature.

e) **Presentation of results** : next lesson, no more than 3 min./student

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Thank you!

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Teacher test " Environmental education ”

CHAPTER 1:

1. How we divide ecosystems?

a. Natural and cosmic
b. **Natural and artificial**
c. Nature and artificial

2. How we can to ensure restoration and cultivation ecosystems?

a. **By establishing protected areas and national parks**
b. By disrupting natural biodiversity
c. By destroying a dysfunctional ecosystem

CHAPTER 2:

3. Which of the following power plants has the least impact on the environment?

a. **Nuclear power plant**
b. Gas power plant
c. Coal-fired power plant

4. Which power plant is called renewable?

a. **Uses natural energy**
b. We can restore it all after a certain time
c. Coal

CHAPTER 3 :

5. In what units is rainfall intensity measured?

a. Liters per second
b. Meters per second
c. **Millimeters per hour**

6. The soil's ability to retain water can be affected

a. the number of animals living in a given area
b. **intensive agriculture**
c. weather forecast

CHAPTER 4:

7. What material loses key properties when recycled and can only be recycled to a limited extent?

a. Glass
b. Iron
c. **Plastic**

8. The marking of plastics determines its:

a. internal chemical composition
b. only properties
c. production method

CHAPTER 5:

9. What waste material can be used to repair shoes?

a. Impregnated paper carton
b. **A worn bicycle tire**
c. Empty PET beverage bottle

10. We can reduce our carbon footprint by:

a. by tracking the carbon footprint of a domestic car
b. **using other modes of transport - cycling or walking**
c. the carbon footprint cannot be reduced

CHAPTER 6:

11. Waste management works with the so-called 3R rule. What is the primary goal regarding waste?

a. Sort waste
b. Recycle waste
c. Do not produce waste

12. What does 3R mean?

a. Refuse, reuse, recycle
b. Remove, relax, reuse
c. Refuse, relax, remake

CHAPTER 7:

13. In landfills, some of the waste decomposes and rots under the influence of microorganisms without access to air. What greenhouse gas is released?

a. Ethane
b. **Methane**
c. Ozone

14. Compost includes:

a. organic waste of plant origin (fruit and vegetable peels, leaves)
b. animal waste (meat, bones)

c. oils, diapers

CHAPTER 8:

15. What is the most important (most significant) for reducing plastic waste pollution?

a. Recycling of plastic
b. Reducing plastic production
c. Plastic reuse

16. A properly applied waste hierarchy has a positive impact on:

a. waste reduction, reuse and recycling
b. energy output of power plants
c. children's mental health

CHAPTER 9:

17. What has the so-called "green economy" been trying to achieve recently?

a. Stop using heavy machinery and go back to the Middle Ages
b. Change recycling policy by making waste sorting legal
c. Transform the current linear economy into a circular one and thereby reduce the amount of waste

18. As individuals, we can contribute to improving the environment by:

a. wearing eco-friendly clothing
b. by washing when the washing machine is half empty
c. trust a company that profiles itself as "green"

CHAPTER 10:

19. What does the term footprint mean?

a. **Location imprint game in soft soil, possibly snow**
b. Regular resting place for game
c. Place of bite of young saplings

20. You can feed animals in the forest

a. With feed for animal feeders
b. With leftover food thrown in the meadow
c. With the snack that you still have after hiking in the forest

Test for the teacher "Methods and organizational forms of teaching"

21. We divide organizational forms of teaching into:
a. according to the environment and number of students
b. by time
c. by space

22. The types of groups in group work are:
a. small, large
b. even, odd
c. homogeneous, heterogeneous

23. The technique of group and cooperative learning is not:
a. chase
b. snowball
c. aquarium

24. The English abbreviation for inquiry-based learning is:
a. ISBE
b. ESBI
c. IBSE

25. The procedure for inquiry-based teaching is:
a. choosing a research question, asking questions, formulating a hypothesis, experimenting, presenting results
b. asking questions, choosing a research question, formulating a hypothesis, experimenting, presenting results
c. asking questions, formulating a hypothesis, choosing a research question, experiment, presenting results