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Methodological guide for teachers

Healthy nutrition
and
Environmental education

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Methodological guide for teachers

Healthy nutrition and Environmental education

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Methodical guide for teachers of healthy nutrition and environmental education

Healthy Nutrition

1. NUTRIENTS

Do you know the terms?

Food, food, food, diet, nutrients.
Proteins, carbohydrates, fats, vitamins, minerals, trace elements

A) INTRODUCTION TO THE TOPIC (15 MIN).

The topic of food concerns each of us, because we have to eat and drink. Thanks to the diet, we have enough nutrients necessary for survival and enough energy for daily activities. However, food also has a direct impact on our physical, mental and emotional health. “We don’t live to eat, we eat to live.”

Foods are substances that contain nutrients. They are of plant or animal origin. They are intended for human nutrition in their unaltered, modified or processed state. Every food has a certain energy and nutritional value.

A diet is a set of meals and dishes for human nutrition.

A meal is a set of dishes eaten at a certain time. For example breakfast, lunch, dinner.

Food is prepared food for immediate consumption. For example mashed potatoes, soup.

Nutrition is the process of processing food in the digestive (gastrointestinal) tract of a person so that individual nutrients are used for the proper functioning of the body.

Nutrients are nutrients present in food. Nutrients are essential for development, growth and all body functions.

Macronutrients are a source of energy and serve to build body mass. They are proteins (proteins), carbohydrates and fats (lipids). Their daily intake is in grams.

Micronutrients are not a source of energy, but they are necessary for the body. These are vitamins, minerals, trace elements and other substances. Their daily intake is in milligrams.

Proteins are the basic building material of tissues and organs, a component of hormones, enzymes and antibodies. A total of 20 amino acids form the structures of various proteins. Protein sources are animal foods (meat, poultry, fish, milk and milk products, eggs) and plant foods (legumes, including soy, tofu and other soy products, cereals, nuts and seeds).

Carbohydrates are the main source of glucose, which is the most readily available and most important source of energy for our body.

Simple sugars have a simple structure, are soluble in water, and taste sweet. They are a quick source of energy and raise blood glucose levels very quickly. They occur naturally in food, e.g. in fruit and unsweetened milk. This also includes table sugar, which is used to sweeten and which is obtained from sugar beet

and sugar cane. We get most of the simple sugars by consuming various industrially processed foods and sweetened drinks. This increases the risk of obesity, cardiovascular disease, diabetes, cancer and tooth decay. Therefore, their intake should be limited.

Starches (polysaccharides) are complex carbohydrates, they have a complex structure and do not taste sweet. They supply energy gradually and maintain a balanced level of glucose in the blood. Their source is plant foods, such as cereals and their products (bread, pastry, pasta, porridge, flakes), pseudocereals (buckwheat, quinoa), potatoes, rice, legumes, vegetables and fruits. Preference should be given to whole grain starchy foods in the diet, which also contain fiber, vitamins, minerals and other beneficial components.

Fiber is a set of different carbohydrates that are difficult to digest or indigestible in the digestive tract and are found only in plant foods. Insoluble fiber supports bowel movement and improves emptying. Soluble fiber forms a gel consistency when in contact with water. Beneficial bacteria in the large intestine can digest (ferment) it, thus maintaining a healthy intestinal environment. Such fiber therefore has prebiotic effects.

Fats are the main source of energy for our body. They accumulate in fat tissue, which serves as a store of energy. However, excessive storage leads to obesity and is harmful to health. Fats also fulfill other roles, such as thermoregulation, vitamin absorption, hormone production and are a source of essential fatty acids. The basic components of fats are fatty acids and glycerol.
Saturated fatty acids are mainly found in animal fats, coconut and palm oil. They have a stiff consistency. With excessive intake, they endanger health and increase the risk of cardiovascular diseases.

Unsaturated fatty acids are mainly found in vegetable oils, nuts, seeds and fish. They promote health and reduce the risk of cardiovascular diseases.

The body cannot create essential fatty acids by itself and is dependent on their intake in the diet. The main source of essential omega-6 fatty acids are vegetable oils, especially sunflower oil. Flaxseeds, walnuts, canola oil and fish oil are rich sources of essential omega-3 fatty acids.

Trans-fatty acids are harmful to health. They are mainly contained in industrially processed foods.

Vitamins, minerals and trace elements are micronutrients that the body needs to perform a range of normal physiological functions. They are essential substances that we must receive from food.

Vitamins are fat soluble (vitamins A, D, E, K) or in water (vitamin C and group B vitamins).

Mineral substances include e.g. calcium, magnesium, sodium, potassium and others.

Important trace elements are e.g. iron, iodine, zinc, copper and more.

REMEMBER!

Food is one of the basic conditions of human existence (similar to water or air (oxygen). The function and purpose of food intake is the supply of energy and nutrients and the all-round support of the physical and mental tasks of the body. Food consists of food. Each food has its own energy and nutritional value.

Sufficient and constant intake of protein in food is essential for the body.

A lack, but also an excessive intake, especially of animal proteins, are not beneficial to health.

Up to two-thirds of the protein intake should be of vegetable origin

As part of a healthy diet, complex carbohydrates should prevail, the intake of simple sugars should be minimized.

All types of fiber are beneficial for health. The recommended daily fiber intake is 30 grams for men and women, for children it is an amount equal to their age + 5 grams per day.

The effect of fats on our health depends on their composition and the amount consumed.

As part of a healthy diet, fats with unsaturated fatty acids should prevail.

Vitamins, minerals and trace elements are essential for the functioning of the body. The body must receive them from food.

Objectives:

- use the correct terminology to describe processes and phenomena associated with human nutrition,
- explain why the human body needs nutrients,
- plan and implement simple projects in the field of nutrition,
- present and defend the results of their work.

Source: https://www.statpedu.sk/sk/metodicky-portal/volitelne-predmety/viem-co-zjem/

Skills: communication, presentation, social

Methods and forms: group work, project teaching.

Recommended age category: 10-14 years

Time: 45-90 min.

Key terms: *food, foodstuff, food, diet, nutrients, proteins, carbohydrates, fats and oils, vitamins, minerals*

Key competences: Group work develops students' communication and organizational skills. After the lesson: Did the students change their diet?

2. FOOD AS A SOURCE OF ENERGY

Energy in numbers. Nutrients as a source of energy.
Energy balance and energy requirements.
How we receive and release energy. My need for energy.

A) INTRODUCTION TO THE TOPIC (15 MIN).

The human organism requires a constant intake of energy for its existence. Nutrients in animal and vegetable foods and beverages are a source of energy. For health, it is necessary that energy intake be in balance with expenditure.

We use the term “calories” and the units kilocalories (kcal) or kilojoules (kJ) to express energy intake and expenditure, as well as the energy content of food. 1 kcal = 4.2 kJ (more precisely 4.184)

Energy balance is the relationship between total energy intake (calories taken from food and drinks) and total energy expenditure (calories used to cover the body’s energy needs). This relationship determines whether our body weight decreases, increases or remains the same.

Energy intake is the amount of energy that the body receives in food and drinks. Only macronutrients are a source of energy. We should get about half of our daily energy from whole grain starchy foods, a maximum of a third from foods containing fats and the rest from foods rich in proteins.

The energy value of macronutrients is different:

Protein	**1 gram = 4 kcal (17 kJ)**
Carbohydrates	**1 gram = 4 kcal (17 kJ)**
Fats	**1 gram = 9 kcal (37 kJ)**

Water (pure, unflavored) contains no calories.

Alcohol also contains energy (1 gram = 7 kcal/29 kJ). It is a harmful and addictive substance.

Every food and drink has its energy and nutritional value. The energy value expresses the energy content, the nutritional value refers to the representation of nutrients in food and drink. Foods and drinks with a high energy value (density, density) usually contain a lot of saturated fat, added sugars and salt (e.g. sweets, chips, chips, mayonnaise, whipped cream, sugary drinks, etc.), while foods with a lower energy value are usually rich in water, fiber, vitamins, minerals and trace elements (e.g. fruits, vegetables,

milk and milk products, etc.).

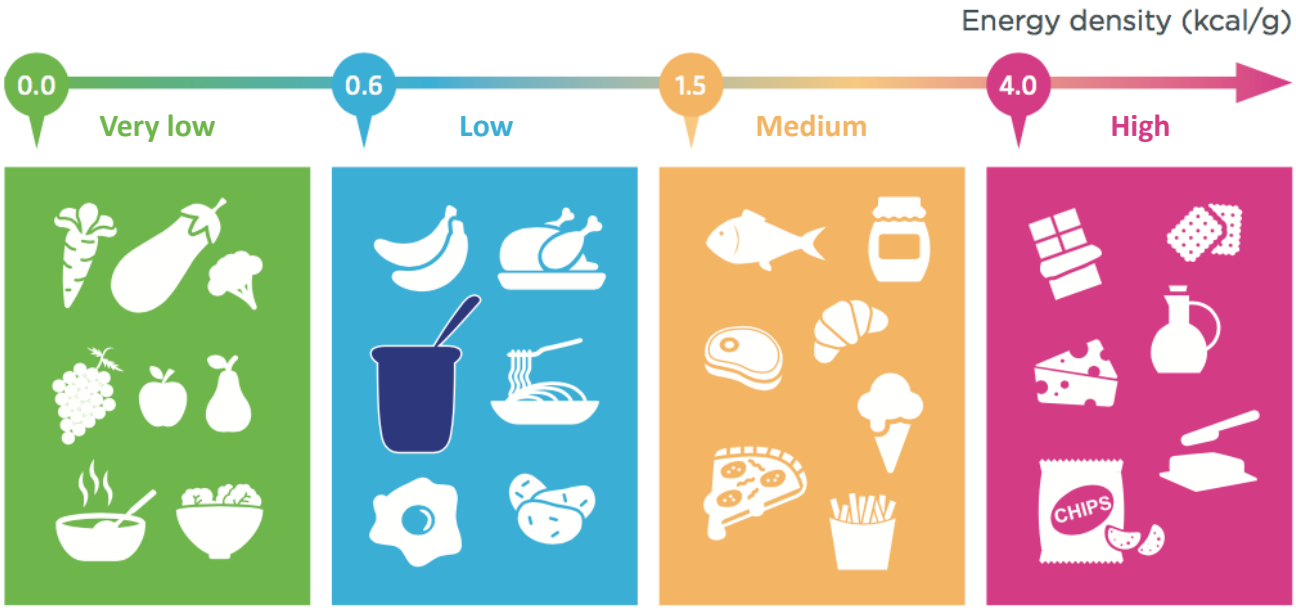

Image source https://www.coachdannymatranga.com/blog/2020/3/11/the-best-kept-fat-loss-tool-eat-lots-and-still-lose-fat

The energy value of food or drink is most influenced by the proportion of water and fat. For example 100 ml of full-fat milk contains 65 kcal (271 kJ), while 100 ml of low-fat milk contains 38 kcal (161 kJ).

The energy content of packaged foods and beverages can be found on their packaging. It is always stated per 100 g of food or per 100 ml of drink or per portion. However, the portion that we usually consume can be larger and we will thus take in more calories than indicated on the package.

Nutrition facts per 100 g	
Energy value	905 kJ/216 kcal
Fats	3,8 g
Saturated fatty acids	1,9 g
Carbohydrates	37 g
Of which sugars	6,6 g
Protein	6,8 g
Salt	1,1 g

NUTRITIONAL VALUES FISH CONTENT		
	100 g of muesli contains on average	1 portion (40 g muesli + 60 ml whole milk
Energy value Energy	1 800 kJ 430 kcal	880 kJ 210 kcal
Protein	8,6 g	5,4 g
Carbohydrates of which sugar	65 g 25 g	29 g 13 g
Fats of us. fatty acids	15 g 5 g	8 g 3 g
Fibre	6g	2,5 g
Sodium	0,4 g	0,2 g
Vitamín B_1	0,3 mg (20 %*)	0,1 mg (7 %*)
Iron	3 mg (20 %*)	0,1 mg (7 %*)
Magnesium Magnesium	94 mg (30 %*)	45 mg (15 %*)

*) percent of the recommended daily allowance. Recalculated according to Souci-Fachmann-Kraut, 6th ed.

Energy expenditure is the amount of energy that our body consumes during the performance of various physical activities and body functions during the day. Energy expenditure consists of:

- Basal metabolism (60-75%). It is the energy to maintain basic bodily functions such as heart activity, breathing, body temperature, etc. It is the minimum amount of energy the body needs to survive.
- Physical activity and movement (10-30%). The more active an individual is, the more energy he needs.
- Thermal effect (about 10%). It is the energy needed to digest food and nutrients. More energy is used for protein digestion, less for fat digestion. More energy is consumed if the food is divided into several daily meals, not all at once.

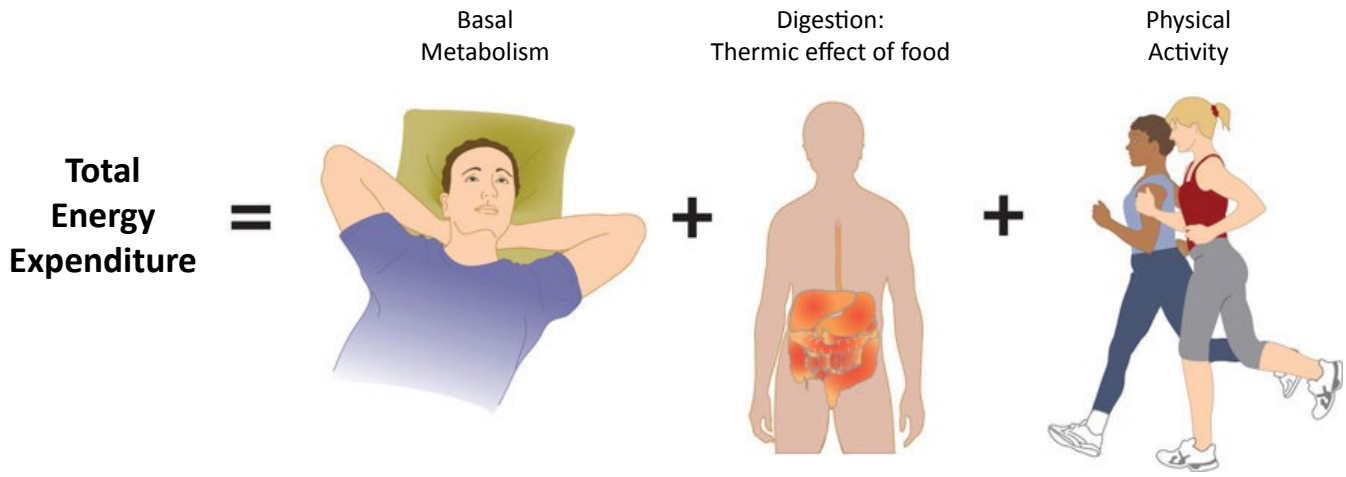

Image source: https://pressbooks.calstate.edu/nutritionandfitness/chapter/estimating-energy-expenditure/

The need for energy is individual. It depends on several factors:

- Gender (more men than women).
- Age (more in the period of growth and development).
- Pregnancy and breastfeeding.
- Physical activity (work and sports).
- Body weight and body composition (more with a higher proportion of muscles).
- Health status (special requirements for certain diseases).
- Body weight control (targeted weight loss, weight gain, maintenance).

The estimated average daily energy requirement is approximately:

Adults	Women 1800-2800 kcal Pregnant and lactating women 2,600-2,900 kcal Men 2000-3200 kcal
Children	1200 – 1800 kcal
Adolescent	Boys 1,600-2,600 kcal Girls 1,400-2,200 kcal
Older adults	Men 1,800-2,400 kcal Women 1,600-2,200 kcal

The stated values depend on age and level of physical activity. Various patterns, online calculators or calorie tables are used for more accurate calculation.

REMEMBER!

If we consume more energy than we need from food, the unused energy is stored as fat and leads to obesity and other related diseases.

For health, it is necessary to have a balanced intake and expenditure of energy, which contributes to a stable body weight.

Foods with a high nutrient content can also be energy-dense, for example vegetable oils, nuts, seeds, some dairy products and grain products can be high in energy density and high in nutritional value. Conversely, some low-calorie foods, such as diet sodas, may contain few calories but usually no nutrients. They provide “empty” calories.

If the goal is weight loss, energy intake should be reduced and energy expenditure should be increased. This should be done under the supervision of a weight expert, especially if it concerns children and adolescents.

Food should provide an adequate amount of energy (calories).
Food rich in nutrients, not energy, should be consumed.
Regular food intake provides regular energy intake.
Attention should be paid to the portion size and its energy value.

Objectives:

- compare basic nutrients as sources of energy for the human body,
- simply distinguish the amount of energy consumed by the human body depending on gender, weight, age,
- explain at an age-appropriate level the impact of unused energy on human health,
- justify the importance of movement in connection with the storage of unused energy in the human body.

SOURCE: https://www.statpedu.sk/sk/metodicky-portal/volitelne-predmety/viem-co-zjem/

Skills: communication, presentation, social

Methods and forms: group work, project teaching

Recommended age category: Energy in my food 12-14 years, Energy shopping 10-14 years

Time: 45-90 min.

Key terms: *energy intake and expenditure, energy value, energy content of food*

Key competences: Group work develops students' communication and organizational skills. After the lesson: Did the students change their diet or add physical activities for energy expenditure?

3. FOOD AND FOOD GROUPS

Vegetables and fruits. Whole grains, pasta, rice and potatoes. Milk, milk products and cheeses. Meat, fish, eggs, legumes, nuts and plant seeds. Fats, oils and spreads. Sugars and salt.

A) INTRODUCTION TO THE TOPIC (15 MIN).

Food, snacks (e.g. coffee, tea, spices) and drinks are edibles, i.e. substances intended for consumption - eating and drinking in an unaltered, modified or processed state. They contain different nutrients and have different energy (calorie) content.

Food groups are groups of foods and beverages that have a similar representation of nutrients and the usual way of consumption. They are represented in the form of food plates or pyramids.

A food pyramid is a visual tool used to represent a balanced diet for a healthy lifestyle. It shows which foods should be preferred in the diet, how much of them should be consumed and how often.

In this chapter, we will introduce the food pyramid and its groups, prepared by experts in Slovakia. The next chapter talks about the amount and frequency of their consumption.

Vegetables and fruits

Vegetables and fruits form the base of the food pyramid. They are a rich source of vitamins, minerals, trace elements, fiber and other beneficial substances. They contain few calories, fruits slightly more than vegetables. They add color and variety to food.

Non-starchy vegetables (except potatoes, sweet potatoes and corn) and fruits belong to this group.

- **One standard serving of vegetables is 80 grams.**
- **Standard portion of 150 grams of fruit.**
- **The recommended daily consumption of vegetables is 400 grams.**
- **Recommended daily fruit consumption is 300 grams.**
- **A maximum of one of the recommended 5 servings of vegetables and 2 servings of fruit per day** can be in the form of:
  – ¾ cup (150 ml) of unsweetened fruit juice or 100% juice
  – ⅔ glass (130 ml) of fruit or vegetable smoothie
  – ½ cup (30 g) of dried fruit

Foods rich in starches

Foods rich in starches (plant polysaccharides) are the main source of energy. They have a good satiating effect. Whole grain starchy foods contain fiber, vegetable proteins, vitamins, minerals and trace elements. Fiber improves digestion, prevents constipation and various diseases of the colon.

This group includes cereals and their products (bread, bakery products, pasta, breakfast cereals without added sugar, oatmeal, porridge), rice, buckwheat, quinoa and starchy vegetables (potatoes, sweet potatoes and corn).

Foods rich in protein

Milk and milk products

They are a rich source of calcium. In addition to proteins, they also contain fats, carbohydrates, various vitamins and other minerals and trace elements.

This group includes drinking milk (cow's, goat's, sheep's), milk products (yogurt, buttermilk, acidophilic milk, sourdough, kefir, kefir milk, cottage cheese, cottage cheese, soft and hard cheeses) and plant-based milk substitutes (they are analogues of milk drinks or yogurts and cheeses made from plant sources, especially from soy. Their composition is different from milk and milk products of animal origin. If they are fortified with calcium, they are a good source of it for people who cannot or do not want to consume milk and milk products of animal origin.).

The number of recommended portions for children and adolescents (5-18 years) is up to 5 portions per day.

One standard portion means:

- Milk (drinking milk, sour milk, fortified soy drink): 1 portion/1 glass (200 ml-250 ml)
- Yogurt: 1 portion/1 jar (125 g-150 g)
- Curd, cottage cheese: 1 portion/1 jar (75-125 g)
- Cheese: 1 serving/2 inches of hand (25 g)
- Hard cheeses, due to their high fat and salt content, should be consumed rarely and in small quantities.
- Dairy products with a high fat and sugar content should be consumed rarely - for example as a dessert.

Meat, poultry, fish, eggs, legumes, nuts and seeds

All foods from this group, like milk and milk products, are rich in high-quality proteins and other beneficial substances, such as iron, iodine and vitamin B12. You don't need to eat a lot of these foods, and they fill you up well.

This food group includes:

Legumes

Legumes (beans, lentils, peas, chickpeas) provide high-quality plant proteins and non-heme iron. They are low in fat and high in fiber. This also includes soybean products (fermented e.g. tempeh, natto, yogurt-like products and non-fermented e.g.g. tofu).

Fish

They are rich in protein and iodine. Oily marine fish, they contain about 10% fat and are a good source of vitamin D and omega-3 fatty acids. It is important to eat different types of fish, marine, freshwater and small fish (sardines with bones).

Poultry

It provides easily digestible proteins and a smaller amount of iron. Prefer lean meat with low fat content.

Lean unprocessed red meat

It is pork, beef, lamb, goat meat and meat from game and rabbit. It is a good source of protein, heme iron and B vitamins, especially B12. Prefer lean meat with low fat content.

Eggs

They are a high-quality source of valuable proteins. Egg white does not contain fat. Egg yolk also contains fat, fat-soluble vitamins, minerals and trace elements, carotenoids with antioxidant effects and cholesterol.

Nuts and seeds

They have a high content of protein and fiber, beneficial unsaturated fats. However, they contain a lot of calories.

Fats, oils, spreads

They are an important source of energy, essential fatty acids and fat-soluble vitamins. They can be of plant or animal origin and have a solid or liquid consistency (oils). Other foods are also rich in fat, such as nuts, seeds, fatty fish and avocados.

All foods of this group contain a lot of energy (calories) and their excessive intake contributes to obesity. Therefore, they should only be consumed in small quantities.

Their composition (fatty acids) influences the effect they have on our health. Vegetable oils (olive, rapeseed, sunflower and others) and fish oil contain unsaturated fatty acids and are beneficial for health. Animal fats (eg butter, lard) and tropical vegetable fats (coconut oil, palm oil, palm kernel oil and coconut butter) contain mostly saturated fatty acids and should be consumed as little as possible.

WARNING! FOODS RICH IN FATS, SUGARS AND SALT

The top of the pyramid is separated and shows foods and drinks that do not belong in a healthy diet. These are mostly various processed foods that contain a lot of energy (calories), fat (saturated fatty acids and trans fatty acids), added sugars and salt. They have a low fiber content ny, vitamins, minerals and trace elements. Food and drinks of this group contribute to obesity, tooth decay and other diseases.

This group includes e.g. packaged soups, sauces, frozen pizza, ready meals, sausages, salami, fries, sodas, cookies, cakes, sweets and much more.

REMEMBER!

It is necessary to eat a varied and balanced diet in order to avoid any deficiency, but also an excess of nutrients and energy. Don't overeat!

The food pyramid is a tool for healthy eating.
A varied selection of food from the first four floors with appropriate frequency and adequate portion size provides enough nutrients and other important substances for the healthy functioning of the body. Along with physical activity, it maintains an optimal body weight and thereby reduces the risk of developing various diseases.
Eating according to the food pyramid is also beneficial for the planet.

Eat vegetables and fruits daily. They should make up at least a third of the daily diet.
Eat varied, colorful and above all fresh vegetables and fruits.
Give preference to seasonal and locally grown vegetables and fruits.

Eat foods rich in starches daily, but in reasonable amounts.
At least half of starch-rich foods should be whole grains.

Milk and milk products are an important source of calcium and protein.
Prefer milk and dairy products with low fat content.
Consume low-fat dairy products with no added sugar.
Eat cheese in smaller quantities.

Eat more legumes, fish, nuts and less meat.
It is recommended to eat 350-500 g of heat-treated red meat per week. The consumption of processed meat should be avoided completely, or eaten only exceptionally and in small quantities.
Eating a mostly plant-based diet and supplementing it with animal foods is beneficial for health. Plant-based foods also have a lower environmental impact.

Fats, **oils and spreads** should only be consumed in small quantities.
Preference should be given to those containing unsaturated fatty acids.

Foods and drinks that are rich in calories, fat, added sugars and salt are not healthy. This group includes many popular processed foods, such as desserts, cakes, cookies, wafers, pretzels, potato chips, hamburgers, fried meat products, sugary drinks, and many others.

If you consume them, do so only occasionally and only in small quantities. Replace them with healthier options.

Objectives:

- apply knowledge about a balanced diet when shopping and eating,
- compile a simple menu in which the requirement of a balanced diet is accepted.

SOURCE: https://www.statpedu.sk/sk/metodicky-portal/volitelne-predmety/viem-co-zjem/

Skills: communication, presentation, social.

Methods and forms: group work, project teaching, role-playing

Recommended age category: Food pyramid plate 10-14 years, Party menu 12-14 years

Time: 45-90 min.

Key terms: *foods, food pyramid, food groups, vegetables and fruits, starches, proteins, fats, sugars, salt*

Key competences: Group work develops students' communication and organizational skills. After the lesson: Did the students change their diet? Have they reconsidered the preparation of food at their celebrations?

4. LIQUIDS, DRINKS AND DRINKING REGIME

Water in the human body, Daily drinking regime, Lack of fluids, Appropriate and inappropriate drinks, Monitoring and evaluation of the quantity and quality of fluids taken during the day

A) INTRODUCTION TO THE TOPIC (15 MIN).

Water in the human body

Water is an important component of the human body and performs various functions in it. The body maintains a balance between intake and output of water. Water is constantly excreted from the body, so we must constantly take it in. We excrete water in the form of urine, stool, breathing and sweating. We take in water in the form of liquids/beverages, less in a diet rich in water, and a small part of water is formed in the organism itself.

Lack of fluids

Lack of water in the body (dehydration) manifests itself in various symptoms. We need to drink enough fluids to avoid dehydration.

Daily drinking regimen

The daily fluid intake is referred to as the drinking regime. It is important to have sufficient fluid intake daily, but it is equally important that we take the appropriate fluids. The daily fluid intake should cover the body's needs in such a way as to replenish water losses and prevent dehydration of the body. The daily need for water for teenagers and adults is usually around 2 liters for girls and women and around 2.5 liters for boys and men. This amount is higher in high outside temperature, during sports or physical work or in certain diseases. It is advisable to take liquids at regular intervals evenly throughout the day.

Appropriate and inappropriate drinks

A non-caloric liquid should form the basis of a proper daily drinking regimen.

Suitable drinks for a proper drinking regime are:

- Drinking tap water is the most suitable drink for a proper drinking regime.
- A supplement to the correct drinking regimen is weakly mineralized natural spring water or non-carbonated or slightly carbonated soft drinks without sugar, unsweetened fruit, herbal, green or white tea 100% fruit or vegetable juice drink occasionally, maximum 100-150 ml and preferably diluted with water.

  Drinks should be at room temperature, too cold and carbonated (bubbly) drinks or too hot drinks are not suitable.

Unsuitable drinks for a proper drinking regime are:

- Drinks with added sugar such as soft drinks and lemonades, fruit drinks, vitamin waters, energy and sports drinks. Their consumption increases the risk of obesity, tooth decay and other health problems.
- Alcohol and any alcoholic drinks, drinks containing caffeine, quinine and strongly mineralized drinks are unsuitable for children and adolescents. Consumption of such drinks should be minimized or avoided.

REMEMBER!

Water is an important component of the human body and performs various functions in it. Lack of water in the body (dehydration) manifests itself in various symptoms. We need to drink enough fluids to avoid dehydration. The daily need for water for teenagers and adults is usually around 2 liters for girls and women and around 2.5 liters for boys and men.

Drinking tap water is the most suitable drink for a proper drinking regime. Drinks with added sugar, such as soft drinks and sodas, fruit drinks, vitamin waters, energy and sports drinks, should be minimized. Their consumption increases the risk of obesity, tooth decay and other health problems.

Objectives:

- explain the meaning and functions of water in the human body,
- identify the conditions that depend on the necessary daily amount of fluids received,
- calculate how much fluid he should take in one day,
- plan a daily drinking regime,
- observe a possible manifestation of fluid deficiency at an age-appropriate level,
- choose suitable drinks for your drinking regime,
- differentiate between foods with a higher/lower water content,
- with the help of the teacher, plan, implement and evaluate a survey about the drinking regime of pupils/siblings/parents.

SOURCE: https://www.statpedu.sk/sk/metodicky-portal/volitelne-predmety/viem-co-zjem/

Skills: communication, presentation, social.

Methods and forms: group work, project teaching, role-playing

Recommended age category: Drinking mode! Do you comply? 10-14 years

Time: 45-90 min.

Key terms: water in the human body, lack of fluids, drinking regime, appropriate and inappropriate drinks

Key competences: Group work develops students' communication and organizational skills.

After the lesson: Did the students change their drinking habits? Did they exchange sweet water for pure water?

5. PORTIONS OF FOOD AND DRINKS

What and how much to eat for proper nutrition? Size and number of portions

A) INTRODUCTION TO THE TOPIC (15 MIN).

A guide and recommendations on proper portion sizes
Food and drinks that belong to individual food groups must be consumed in adequate quantities in order to supply the body with enough necessary nutrients and energy so that we do not have either an excess or a lack of them.

To express an adequate amount, the so-called standard portions that are suitable for daily or weekly consumption. For a portion, its size and number are defined.

Portion size is expressed in different ways, such as a bowl, cup, tablespoon and teaspoon or pieces, units of measurement (grams, milliliters). Hands, palms, and fingers are very simple and practical.

The size and number of portions are designed for a healthy adult and for a daily energy intake of 8,400 kJ/2,000 kcal. They may vary slightly depending on people's gender, age or physical activity.

The food pyramid shows the size and number of portions of food and drinks for food groups.

How to eat fruits, vegetables and salads
Consume daily. They should make up at least a third of the daily diet. Vegetables should make up a larger share. You have to eat different kinds, the variety of species and colors matters. Local and seasonal species are suitable. Vegetables and fruits should be eaten mainly fresh and whole or prepared in a gentle way (cooking, stewing).

5 portions of vegetables and 2 portions of fruit per day.

One serving of vegetables can be: 1 glass (200 ml) of leafy vegetables or half a glass of other vegetables (eg carrots, peas) or a piece (eg tomato, half a pepper, small cucumber).

One portion of fruit can be: 1 larger slice of fruit (pineapple, melon), 1 piece of medium fruit (apple, pear, banana, orange), 2 pieces of smaller fruit (mandarins, plums), a handful of small fruit (raspberries, strawberries, blueberries).

A maximum of one portion per day can be as follows: ¾ cup of unsweetened fruit juice or 100% juice, 2/3 cup of fruit or vegetable smoothie, ½ cup of dried fruit.

How to eat whole grain bread, cereals, pasta, rice and potatoes
Consume daily. At least half should be whole grain.
3-5 servings a day.

Smaller numbers for children, women, elderly people, with low physical activity. For physically active people and young men, up to 6-7 portions per day.

One serving can be: 2 thin slices of bread, ½ cup of dry oatmeal or unsweetened cereal í, 1 cup of cooked rice, pasta or cereal (bulgur, couscous, polenta, quinoa), 1 cup of cooked cereal or corn flakes, ½ corn (grain), 2 medium or 4 small potatoes, 1 cup of sweet potato.

How to eat milk, dairy products and cheese
Consume daily. Prefer milk and sour milk products (yogurt, sour milk) with a lower fat content.

3 servings a day.

Children and adolescents up to 5 servings a day.

One serving can be: 1 glass (200 ml) of milk, sour milk or fortified soy drink, 1 yogurt (125 grams flavored and sweetened, 150 grams natural without added sugars), a third or half of a package of cottage cheese or cottage cheese, 2 inches of hand/2 slices of hard cheese.

How to eat meat, poultry, fish, eggs, legumes and nuts
You need to eat more fish and legumes, less meat. Foods from this group should be alternated.

2 servings a day.

One portion can be: a palm without fingers of heat-treated lean meat (beef, lamb, pork) and poultry, a palm with fingers of heat-treated fish, 2 eggs, a glass of boiled legumes or tofu, 40 g of unsalted nuts or seeds.

Weekly, this means: 2 portions of fish (one of which is oily), 2-3 portions of legumes, 2-3 portions of lean meat, 2-3 portions of poultry, 2-4 eggs, 2-3 portions of nuts or seeds. 3 portions of food and drinks

Consume processed meat and meat products, especially red meat, only occasionally and in small quantities. Limit the consumption of poultry meat in the form of nuggets, strips and other fried products.

How to eat fats, oils and spreads
Consume only in small quantities. Choose those whose composition (fatty acids) are beneficial for health.

Limit fats with a predominance of saturated fatty acids (e.g. butter, lard, coconut oil, palm oil and others).

Uprednostňovať rastlinné oleje (napr. olivový, repkový, slnečnicový a iné). Odporúčaná porcia je 1 čajová Prefer vegetable oils (e.g. olive, rapeseed, sunflower and others). The recommended portion is 1 teaspoon per person.

Preference should be given to spreads with a low fat content. The recommended portion is 10 grams, enough for 2 slices of bread.

Homemade cottage cheese, legume or fish spreads or avocado are suitable for spreading.

How to consume foods and drinks rich in fats, sugars and salt
They are not healthy. It is recommended not to consume them at all, or only in small quantities and only occasionally. It is ideal to replace them with more suitable and healthier foods.

REMEMBER!

Do not forget that the menu should be varied in order to get all the necessary nutrients.

Objectives:

- compare basic nutrients as sources of energy for the human body,
- simply distinguish the amount of energy consumed by the human body depending on gender, weight, age,
- explain at an age-appropriate level the impact of unused energy on human health,
- justify the importance of movement in connection with the storage of unused energy in the human body.

SOURCE: https://www.statpedu.sk/sk/metodicky-portal/volitelne-predmety/viem-co-zjem/

Skills: communication, presentation, social.

Methods and forms: group work, project teaching, role-playing

Recommended age category: 10-14 years

Time: 45-90 min.

Key terms: *portion size and number*

Key competences: Pupils will acquire knowledge about the correct portions of food, which they can apply in practical life. Group work develops students' communication and organizational skills.

6. HEALTHY EATING

Why we eat, What we eat, How much we have to eat, How nutrition is related to health, Balanced diet, Healthy plate, Healthy eating pyramid

A) INTRODUCTION TO THE TOPIC (15 MIN).

Why do we eat?

Our body needs a constant supply of energy and various nutrients for its functioning. Their source is food. In addition, he needs to receive water every day. Regular food intake is important for all processes in the human body.

Hunger informs us about the need to take food. After eating, a feeling of satiety occurs. Feelings of hunger and satiety are regulated by the hypothalamus (part of the brain) and the hormones leptin (hunger hormone) and ghrelin (satiety hormone) and other signals.

What we eat

We eat food that consists of various foods of animal or plant origin. According to the representation of nutrients, the method of usual consumption and origin, we divide them into food groups. In the food pyramid, these are food groups: non-starchy vegetables and fruits, foods rich in starches, foods rich in proteins (dairy and others), fats, oils and spreads. We should mainly eat basic and as little industrially processed food as possible. You should choose nutritionally valuable foods that are rich in nutrients and provide an adequate amount of energy.

How much do we have to eat

Our body needs to consume such an amount of food daily that all its nutritional requirements for the supply of energy and nutrients are met. These requirements are different due to gender, age, physical activity, health status and, for women, pregnancy and breastfeeding. Lack or excess of received energy and nutrients negatively affects the functioning of the body and can lead to damage, which manifests itself in health problems or illnesses.

How nutrition is related to health

Diet and nutrition is one of the factors that has a significant impact on the length of human life and the occurrence of various diseases. These are mainly chronic non-infectious diseases, such as overweight and obesity, diseases of the heart and blood vessels, type 2 diabetes and some tumors. The caloric value of our diet and the representation of individual nutrients in it act in our body through several mechanisms and either support health or, on the contrary, damage it.

It is important for good health:

- **Eat healthy.**
- **Have sufficient physical activity and limit a sedentary lifestyle.**
- **Maintain optimal body weight and waist circumference.**

- **Do not smoke! Avoid alcohol and other addictive and harmful substances.**
- **Get enough sleep.**
- **Maintain mental well-being and manage mental stress.**

A balanced diet. A healthy plate. Healthy eating pyramid.

A healthy diet contains a balanced amount of energy, nutrients and other necessary substances. It ensures the proper functioning of our organism and is beneficial to health.

In order for people to eat healthily, experts prepare dietary recommendations based on food groups based on scientific research. These are represented using food plates or pyramids.

REMEMBER!

Food is one of the basic conditions of human existence.

Healthy eating according to the principles of the Food Pyramid also expresses the so-called **"THE TEN POINTS OF HEALTHY EATING"**.

1. Eat a varied, balanced diet and don't overeat.
2. Eat more vegetables and fruits daily.
3. Prefer whole grain foods from cereals.
4. Prefer milk and dairy products with low fat content.
5. Eat more legumes and fish, less meat.
6. Consume fats, oils and spreads that promote health.
7. Avoid foods and drinks rich in sugar, fat and salt.
8. Drink water when you are thirsty. Do not drink or limit the consumption of alcoholic beverages!
9. Shop, prepare and eat mindfully. Take care of gentle and safe food preparation.
10. Be physically active every day, maintain an optimal body weight and waist circumference.

Objectives:

- apply knowledge about a balanced diet when shopping and eating,
- compile a simple menu in which the requirement of a balanced diet is accepted.

SOURCE: https://www.statpedu.sk/sk/metodicky-portal/volitelne-predmety/viem-co-zjem/

Skills: communication, presentation, social

Methods and forms: group work, project teaching

Recommended age category: 12-14 years

Time: 45-90 min.

Key terms: food pyramid, balanced diet, healthy diet, ten principles of healthy eating

Key competences: After the implementation of the lesson - Did the students change their diet? Have they changed their lifestyle?

Group work develops students' communication and organizational skills.

7. EATING OUT

Eating at school, Eating at a restaurant, Eating at a fast food restaurant, Food packaging (labels): information on the composition and nutrients in food, Advertising and food

A) INTRODUCTION TO THE TOPIC (15 MIN).

Food eaten away from home is not just about satisfying hunger. It builds social relations, social bonds, enables the experience of diverse cuisine and supports cultural exchange. It is part of social, cultural and religious events, entertainment and work meetings. It contributes to the development of trade and the creation of jobs. Controlling healthy eating outside the home tends to be more difficult because it is subject to multiple influences. It is facilitated by properly formed eating habits of a person.

Meals at school

Balanced meals with an adequate amount of energy and representation of the necessary nutrients ensure a stable release of energy throughout the day, which supports brain function, concentration and attention. A varied diet rich in vitamins, minerals, fiber and high-quality proteins with the right drinking regime improves cognitive functions, the ability to learn and remember information. It also affects our mood and emotional resilience. Diet, drinking regime, exercise, ideally in the fresh air, sleep, relaxation and other factors are important for effective learning and achieving better academic results.

Healthy snack

A healthy snack is an important source of energy and nutrients. Planning a snack in advance allows you to control the content of nutrients and the amount of energy. At the same time, it reduces the desire for unhealthy foods and their consumption. A healthy snack should contain vegetables, fruits, sources of fiber, easily digestible proteins and a suitable drink in sufficient quantity.

Examples of suitable snacks: fresh fruit, vegetable snack with dip, vegetable wrap, smoothie with fruit, vegetables and milk or yogurt, whole grain bread with avocado, salmon, egg, cottage cheese or unsweetened yogurt with fruit and nuts, whole grain crackers with cheese.

Lunch at school

Meals in school canteens have their limitations, but even here there are efforts for a wider selection of meals, the inclusion of vegetables, legumes and fish in their preparation. Try to avoid sugary drinks with lunch - plain water is best. Don’t waste food! If you prepare lunch at home and carry it to school, you have a better chance to prepare it according to the principles of healthy nutrition.

Dining in a restaurant

The offer in restaurants is very broad and requires our conscious decision-making. Choose mainly dishes made from fresh ingredients and treat yourself to delicacies only occasionally. Prefer meals that contain vegetables, lean meat, fish, whole grain foods and are prepared by cooking, steaming or stew. Drink pure water, unsweetened mineral water or tea with meals, not sweetened drinks. Pay attention to the appropriate portion size. The appetizer or soup should not fill you up too much. For desserts, choose less sweet

and fatty options. Enjoy your food, eat slowly and with breaks. This helps the brain recognize the fullness of the stomach and regulate the feeling of satiety. Do not be influenced by the environment and stick to the principles of healthy eating. Learn to say no assertively.

Eating in fast food

Eating healthy in fast food places is a big challenge. Although some chains offer healthier options, most of the dishes are not healthy. They are high in calories, saturated fat, added sugars, salt, preservatives and artificial flavors. Many of them belong to highly processed foods that increase body weight and the risk of developing chronic diseases when consumed regularly. If you eat fast food, do so only exceptionally. Choose healthier options, smaller portions, avoid fried foods, sauces, chips, extra portions for free, drinking sweetened and cola drinks, caffeinated drinks with cream or whipped cream.

Food packaging (labels): information on the composition and nutrients in food

Food labeling serves to identify foods, providing basic information about their composition and nutritional content. Food labeling is regulated by law and aims to promote transparency in the food industry, ensure food safety and provide consumers with choice. In accordance with the laws, the manufacturer must provide some data compulsorily, others voluntarily. They are on the front or back of the packaging.

On the back of the label we find the composition, allergens and nutritional information of the food.

- The ingredients in the food are listed in descending order and in percentages. Too many ingredients can mean it's highly processed. The specific type of fat or source of sugar in the given food is also important. Food components are also various additives, e.g. dyes, preservatives and others. They are marked with the letter E with numbers. These substances are safe in the permitted amount when consuming food.
- Allergens must be marked with a different color or font from the other ingredients.
- Nutritional information is usually in a table and is given per 100 g or 100 ml of food, or per portion. Mandatory nutritional information is the energy value in kJ/kcal (4.2 kJ = 1 kcal), fat and saturated fatty acids, carbohydrates and sugars, proteins and salt. Fiber, vitamins, minerals and others are optional.

On the front of the food, the manufacturer also voluntarily uses a graphic symbol (usually based on the principle of a traffic light), which expresses the total nutritional value of a certain type of food. Such a symbol significantly helps in the purchase and selection of foods with a more suitable nutritional composition. Allowed nutrition claims and other symbols can also be stated on the front of the food, which express that it is e.g. gluten-free food or a vegan product.

Data on the expiration date of the food are:

- The minimum durability date means that the food can be consumed even after the specified date, if the food has been stored correctly and its packaging has not been damaged.
- The use-by date ("use by...") means that the food is not recommended to be consumed after the stated date.

Advertising and food

Advertising is a communication tool for promoting products or services with the aim of selling them. Food advertising is regulated by law. However, it significantly affects our behavior - buying and consuming food. We should not be subject to it.

Our recognition of advertising tactics, obtaining more information about food, distinguishing between our desires and needs is important for healthy eating. Food advertising can be useful if it promotes healthy eating.

REMEMBER!

Diet, drinking regime, movement ideally in the fresh air, sleep, relaxation and other factors are important for effective learning and achieving better academic results.

A healthy snack should contain vegetables, fruits, sources of fiber, easily digestible proteins and a suitable drink in sufficient quantity.

If you eat fast food, do so only exceptionally. Choose healthier options, smaller portions, avoid fried foods, sauces, chips, extra portions for free, drinking sweetened and cola drinks, caffeinated drinks with cream or whipped cream.

Our recognition of advertising tactics, obtaining more information about food, distinguishing between our desires and needs is important for healthy eating. Food advertising can be useful, a k supports healthy eating.

Objectives:

- observe the consumption of excessive or very little food by oneself/siblings/parents,
- apply knowledge about the risks of an inappropriate drinking regime in your diet,,

SOURCE: https://www.statpedu.sk/sk/metodicky-portal/volitelne-predmety/viem-co-zjem/

Skills: communication, presentation, social.

Methods and forms: group work, project teaching

Recommended age category: 10-14 years

Time: 45-90 min.

Key terms: healthy eating, food labeling, nutritional information

Key competences: Group work develops students' communication and organizational skills.

8. RISKS OF INAPPROPRIATE EATING

Eating patterns and models, Inappropriate lifestyle - impact on health and fitness, Eating disorders, Overeating and obesity, Triggers of overeating, Where to seek help for obesity or eating disorders, Food allergies and intolerances

A) INTRODUCTION TO THE TOPIC (15 MIN).

Inappropriate eating can bring certain risks that have different causes, manifestations and consequences for health.

Eating patterns and models

A dietary pattern (model, method, style) represents the combinations of foods and drinks that a person usually consumes over a certain period of time. A varied diet with an adequate intake of energy and all nutrients is the most suitable for a healthy person.

Dietary styles associated with better health and prevention of chronic diseases are characterized by a high intake of vegetables, fruits, legumes, nuts, seeds, grains, and olive oil; low to moderate intake of dairy products, fish and poultry; infrequent consumption of red and processed meat; infrequent and moderate alcohol intake only in adults. The most famous of them is the Mediterranean way of eating.

The “Western style” of eating is typical for most people in developed countries. It is dominated by the consumption of highly processed foods, excessive intake of calories, high intake of saturated fats, sugars and salt. Together with low physical activity and a sedentary lifestyle, it causes an increase in body weight and the emergence of several chronic diseases.

Vegetarianism (no consumption of meat, sometimes fish) and veganism (no consumption of animal products, including dairy products, eggs and sometimes honey) are also common dietary styles. Even if their benefits outweigh the risks (e.g. lack of certain vitamins and minerals, proteins), practicing them is not just about simply excluding certain foods from the diet. In the case of children and adolescents, special attention must be paid to the correct nutritional value of the food consumed.

Other alternative eating styles are more difficult to practice and the risks of improper nutrient intake are greater. Various diets and restrictions on the consumption of food or any of its components without medical reasons are generally inappropriate, especially for children and adolescents. They can lead to disorders of the growth and development of the organism, to improper functioning of the immune system, to skin problems, fatigue, exhaustion, or to disorders of the function of the sexual organs.

Some diseases or medical conditions (e.g. diabetes, celiac disease) require certain dietary measures, but these are part of the treatment and are usually managed by a doctor, nurse or nutritionist.

An eating style based on a predominantly plant-based diet supplemented with suitable foods of animal origin is today considered the most suitable way of a varied and balanced diet, which most people can easily and long-term follow. At the same time, it is reasonably environmentally friendly.

Inappropriate lifestyle - impact on health and fitness

The most important components of an incorrect lifestyle are improper eating and inappropriate nutrition, excessive alcohol consumption, smoking, lack of physical activity and a sedentary lifestyle. They increase the risk of various chronic diseases and premature death.

Eating disorders

Eating disorders are serious mental illnesses that are manifested by abnormal eating habits that damage the body. These include anorexia nervosa, bulimia, binge eating and other, less common diseases. Various factors can trigger them, e.g. the pursuit of fashionable slimness, a perfect figure, perfectionism and others. They require timely professional help.

Overeating and obesity

Overeating, i.e. excessive intake of calories, leads to the accumulation of fat reserves in the body and to an increase in body weight (overweight or obesity). For health, you need to have an adequate body weight for your height (this is expressed by the body mass index, BMI) and an adequate body composition (the proportion of body fat and muscle mass). **Obesity is a separate disease and a risk of developing many other diseases.** Age-appropriate body weight and good physical fitness are very important for health.

Binge eating triggers

Binge eating or overeating is eating without feeling hungry. The most common triggers include emotional states (stress, mood), appearance, smell and portion of food, part of the day (evening), social events (visits, parties, holidays). Overeating leads to weight gain. Psychological techniques that deal with a person's thoughts, feelings and behavior when eating are used to manage binge eating.

Where to seek help for obesity or eating disorders

Early professional help is key. First of all, you should contact your attending physician (for adults it is a general practitioner, for children and adolescents it is a pediatrician - a doctor for children and adolescents). The doctor assesses the condition and recommends its solution, as often specialized health care from various experts is needed. **Do-it-yourself solutions or internet resources may not lead to success and may make the situation worse!**

Food allergies and intolerances

These are two different types of adverse food reactions.

An allergy is an exaggerated reaction of the human immune system to a usually harmless substance. This substance is called an allergen, it is a protein from food, pollen, house dust, animal hair or mold. Most allergies appear during the first year of life and can be hereditary. **Food allergies are most often caused by milk, eggs, fish, crustaceans, nuts, peanuts, wheat, soy.** Allergies are manifested by skin or respiratory symptoms and can also be life-threatening. A person with an allergy must strictly avoid consuming even a small amount of food that contains the given allergen.

Food intolerance is not an immune reaction. It is caused by a lack of certain digestive enzymes. The symptoms are less serious, rather unpleasant. These are digestive and skin manifestations or headaches. The most common food intolerances are **lactose intolerance** (milk sugar), **fructose intolerance** (fruit sugar), **histamine intolerance** (histamine is a substance in proteins) and **gluten intolerance** (gluten is a complex of different proteins found in cereal grains such as wheat, barley and rye). Food intolerance is most

often caused by dairy products, some types of vegetables and fruits, chocolate, eggs (mainly egg white), food additives, alcoholic and non-alcoholic drinks (fruit juices), foods containing histamine (sausages, ripening cheeses, pickled vegetables and others). A person with intolerance tolerates these foods individually, small amounts are usually well tolerated.

REMEMBER!

Inappropriate eating can bring certain risks that have different causes, manifestations and consequences for health.

An eating style based on a predominantly plant-based diet supplemented with suitable foods of animal origin is today considered the most suitable way of a varied and balanced diet, which most people can easily and long-term follow. At the same time, it is reasonably environmentally friendly.

The most important components of an incorrect lifestyle are improper eating and inappropriate nutrition, excessive alcohol consumption, smoking, lack of physical activity and a sedentary lifestyle. They increase the risk of various chronic diseases and premature death.

Early professional help is key. First of all, you should contact your attending physician (for adults it is a general practitioner, for children and adolescents it is a pediatrician - a doctor for children and adolescents). The doctor assesses the condition and recommends its solution, as specialized health care from various experts is often required. Do-it-yourself solutions or Internet resources may not lead to success and may make the situation worse.

A person with an allergy must strictly avoid consuming even a small amount of food that contains the given allergen.

A person with intolerance tolerates these foods individually, small amounts are usually well tolerated.

Objectives:

- observe the consumption of excessive or very little food by oneself/siblings/parents,
- explain some reasons for eating disorders at an age-appropriate level,
- argue about the importance of regular physical activity in connection with obesity,
- assess the impact of lack of exercise on the human body at an age-appropriate level,
- apply knowledge about the risks of an inappropriate drinking regime in your diet

SOURCE: https://www.statpedu.sk/sk/metodicky-portal/volitelne-predmety/viem-co-zjem/

Skills: communication, presentation, social.

Methods and forms: group work, project teaching

Recommended age category: 10-14 years

Time: 45-90 min.

Key terms: diet, eating style, eating disorders, food allergies and intolerances

Key competences: Group work develops students' communication and organizational skills.

9. FOOD SAFETY AND HYGIENE

Food contamination. Purchase, storage, handling, preparation and consumption of food. Food safety labeling. Food additives.

A) INTRODUCTION TO THE TOPIC (15 MIN).

Safe food is a prerequisite for people's health. This means preventing any contamination of food and observing basic hygiene habits in all activities with food.

Food contamination

Food contaminants are harmful substances (pollutants and m micro-organisms) that can cause infectious diseases caused by bacteria, viruses, and parasites or toxic diseases caused by chemical substances such as mycotoxins produced by fungi, heavy metals such as lead, cadmium, mercury, radioactive substances and others.

Infectious diseases can be caused by the consumption of insufficiently heat-treated meat, unpasteurized milk and milk products, insufficient hygiene in the handling and consumption of food, or contaminated soil, water or contact with an infected animal. Symptoms of infection develop quickly and include fever, headache, nausea, vomiting, abdominal pain, and diarrhea. Chemical contamination usually does not immediately lead to health problems (poisoning is an exception), but it can gradually affect a person's immune or hormonal system and lead to diseases such as cancer.

Food safety is very important for pregnant women, small children, the elderly and for sick people, especially those with immune disorders.

Eating safe food means above all knowing how to properly buy, prepare, store and consume food.

Purchase, storage, handling, preparation and consumption of food.

The basic measures for safe food are:

When purchasing:

- Buy fresh and unspoiled food (vegetables, fruit, meat). Fish from verified sources.
- Monitor the expiration date of food.
- Use cooling packages when transporting perishable food.

When storing:

- keep the storage conditions for individual foods (in the cold, at room temperature, in a dry place, etc.).
- Store cooked food at room temperature for up to 2 hours, then in a refrigerator at a temperature of 5°C. At this temperature, the multiplication of bacteria slows down, so food can be stored longer.

- Store raw food and food separately from cooked food.
- Store food in closed containers.

When handling:

- Wash your hands thoroughly before preparing food (with warm water and soap).
- Wash and clean food (fruit, vegetables, meat).
- Keep all areas and things used in food handling clean.
- Use separate tools (knives, containers, plates) for raw and cooked food.

When preparing:

- Take care of sufficient heat treatment of meat, eggs, and seafood. Maintain a temperature of 75°C for at least 15 minutes (even in the middle of the meat, check with a meat thermometer). Bacteria are killed at this temperature.
- Never grill over an open flame. In doing so, dangerous substances are created which are considered to be of high risk for the development of cancer. Such substances are also formed in burnt fats and oils, during frying and smoking.
- Prefer gentle methods of heat treatment, such as cooking or steaming. High temperatures during grilling, frying, baking or deep-frying especially meat, but also starchy foods (potatoes, bread) lead to the formation of harmful cancer-causing substances. These methods of modification are rarely used.

When consuming:

- Wash your hands well before every meal!
- Drink and use safe water from safe and known sources (eg drinking water, bottled drinking, mineral and spring water).
- Do not consume food after its expiry date. After opening, such food must be stored according to the stated conditions and consumed within the stated number of days after opening. If the minimum shelf life date is indicated, the food has been properly stored and its packaging has not been damaged, it is safe even after this date and can be consumed.
- Consume heated food immediately, do not reheat it.
- Do not refreeze thawed food. Process them immediately, do not leave them at room temperature for a long time.
- When heating food in a microwave oven, follow the recommended heating time and temperature.
- Do not consume food contaminated with mold, even after its removal (bread, pastries, compotes, yogurts, etc.).
- Do not eat burnt and baked food.
- Give preference to bio-quality foods, which are usually less contaminated with fertilizers and chemicals.

Food safety labeling

From the point of view of food safety, the most important information on food packaging is the minimum durability date or use-by date and ingredients causing allergies or intolerances.

Food additives

Additives (food ingredients, additives) are any chemical substances that are added to food to achieve specific desired effects in the food. Only permitted substances may be used and only in permitted quantities. They must be listed on the product label and marked with the letter E, which means that they have been approved in the European Union as safe. People with allergies or increased sensitivity to some additives should pay attention to them. Highly processed foods contain many additives.

Fortification is the addition of nutritionally beneficial substances, such as vitamins, minerals, fiber and other nutrients, to foods in order to reduce the consequences of their deficiency, or to replace substances whose content has decreased during food processing. A well-known example is the enrichment of salt with iodine and thereby preventing the development of thyroid disease. Available there are many fortified foods, such as flour, cereals, juice, milk and milk products. The addition of beneficial substances to these foods is beneficial for health, but it is more important to follow the general advice on healthy eating.

REMEMBER!

Food safety is very important for pregnant women, small children, the elderly and for sick people, especially those with immune disorders. Eating safe food means above all knowing how to properly buy, prepare, store and consume food.

For safe eating, observe:

- Correct hygiene habits. Wash your hands thoroughly before and during food preparation.
- Buy safe and harmless food.
- Store food properly.
- Take care of safe and hygienic food preparation.
- Eat fresh and safe food.
- Use safe water.

Objectives:

- observe correct hygiene procedures when handling food,
- properly store various foods in and outside the refrigerator,
- differentiate between fresh, perishable and spoiled foods,
- find the food composition table and additives on the package,
- assess the use-by date of specific foods according to its labeling on the packaging,
- observe proper hygiene habits in connection with the prevention of diseases.

SOURCE: https://www.statpedu.sk/sk/metodicky-portal/volitelne-predmety/viem-co-zjem/

Skills: communication, presentation, social.

Methods and forms: group work, project teaching

Recommended age category: 10-14 years

Time: 45-90 min.

Key terms: food safety, health problems, food contamination, food additives

Key competences: Pupils will acquire knowledge about the correct way of storing food. They understand that improper food storage causes health problems. Group work develops students' communication and organizational skills.

10. SUSTAINABLE EATING: FOOD THAT IS HEALTHY FOR PEOPLE IS ALSO HEALTHY FOR THE EARTH

Sustainable eating, Climate change, environment and food security, Food production and consumption and their impact on climate conditions - „from farm to table“.

A) INTRODUCTION TO THE TOPIC (15 MIN).

Food is not only a means of satisfying hunger and gaining energy, but also has a significant impact on our health and the planet we live on. Our healthy eating choices contribute to a sustainable lifestyle for us and for future generations.

Sustainable eating

Sustainable eating is a way of consuming food that ensures enough food for the current population while minimizing negative impacts on the environment, social justice, health, economy and future generations. Sustainable eating is characterized by: gentle agriculture with ecological and regenerative methods, imitation of natural ecosystems when growing crops and raising farm animals, minimization of environmental pollution, consumption of local, nutrient-rich and minimally processed food, food production in fair conditions, sale of food at fair prices.

Climate change, environment and food security

Climate change, the environment and food security are interrelated. Food security is ensured when all people have access to sufficient, safe and nutritious food. However, this situation is threatened by population growth, economic factors and the negative effects of food production and consumption, which lead to climate change and worsen the environment. In order to achieve food security, it is essential to promote sustainable agriculture and ensure a fair distribution of food.

Food production and consumption and their impact on climate conditions - “from farm to table”

“Farm to Fork”, F2F, is a European strategy to achieve a healthy, fair and environmentally friendly food system. It is supposed to bring healthier food, reduce the environmental footprint of agriculture and ensure food security and fair remuneration for farmers.

Any human activity has an impact on the environment. Mass production and globalization make this situation even worse. The environmental impact is expressed most often as a carbon and water footprint. The carbon footprint is the total amount of greenhouse gasses that are created by human activity. Greenhouse gasses are gasses in the atmosphere such as carbon dioxide, methane, and water vapor. They absorb part of the heat that is generated when the planet is heated and thus create a greenhouse effect that increases the temperature of the earth’s surface. The water footprint indicates the volume of fresh water in liters or cubic meters that is used in the production of a consumer good or service.

We can calculate our carbon and water footprint on several websites on the Internet.

The entire food chain - food production, processing and transport, sales and our consumption - has a significant negative impact on the environment and climate.

- Conventional agriculture produces about 20% of total greenhouse gas emissions and is the largest major consumer of water (up to 80% of total water) for crop irrigation.
- Cultivation of one crop on a large area (monoculture agriculture) and intensive breeding of farm animals leads to deforestation, damage to the soil and the network of microorganisms living in the soil, thereby disrupting forest ecosystems.
- Excessive and illegal fishing contributes to the depletion of marine resources and the disruption of aquatic ecosystems.
- Excessive use of pesticides endangers organisms for which they are not intended, contaminates soil and water, and affects our health through the food chain.
- Fossil fuel energy is used to process and transport food, which also results in carbon emissions.
- Excessive food packaging increases overall waste production and food waste contributes to methane emissions in landfills.

Plant-based foods generally have a lower carbon and water footprint compared to animal-based foods. Eating a predominantly plant-based diet is thus beneficial not only for our health, but also more environmentally friendly.

Minimizing the waste of resources and reducing food waste is an important step to protect the environment. Many people on the globe are starving and the paradox is that a large amount of food is wasted. Therefore, never throw food away unless it is necessary! Put only the food on your plate and the amount that you will definitely eat.

The food waste pyramid also offers options for effectively and environmentally friendly reduction of food waste: reducing the amount of waste is the most important, then donating food to people in need, feeding farm animals, composting, and the last option is getting rid of waste.

Basic practices for minimizing food waste are:

meal planning, shopping with a prepared list, tracking use-by dates, serving adequate portions, storing food properly, using leftovers and composting. In this way, we not only reduce food waste, but also save resources for food production.

Foods that are healthy for people are also healthy for the Earth

Sustainable eating means choosing and eating foods that are healthy for people and the environment.

The double pyramid model is one suggestion that helps to visualize which foods should form the basis of the diet and which should be consumed less often in terms of their environmental impact.

It means:

1. Increasing the proportion of plant foods.
2. Support of local sources and local producers.
3. Preference for organic / bio / eco foods.
4. Choosing sustainable fish and seafood.

5. **Responsible consumption** of meat.
6. Support of fair trade.
7. Minimizing processed foods.
8. Gardening and own cultivation.

REMEMBER!

Sustainable eating is characterized by: gentle agriculture with ecological and regenerative methods, imitation of natural ecosystems when growing crops and raising farm animals, minimization of environmental pollution, consumption of local, nutrient-rich and minimally processed foods, food production in fair conditions, selling food at fair prices.

To achieve food security, it is essential to promote sustainable agriculture and ensure a fair distribution of food.

Plant-based foods generally have a lower carbon and water footprint compared to animal-based foods. Eating a predominantly plant-based diet is thus beneficial not only for our health, but also more environmentally friendly.

Basic practices to minimize food waste are: meal planning, shopping with a prepared list, tracking expiration dates, serving adequate portions, storing food properly, using leftovers, and composting are basic practices to minimize food waste. In this way, we not only reduce food waste, but also save resources for their food production.

Objectives:

- Know the causes of food waste and estimate their consequences on a global scale.
- Link the connections between food waste in rich countries and hunger in developing countries.
- Learn to minimize food waste in the home and manage food wisely.
- Be able to discuss solutions to food waste.

Skills: communication, presentation, social.

Methods and forms: group work, project teaching

Recommended age category: 10-14 years

Time: 45-90 min.

Key terms: sustainable eating, food safety, carbon and water footprint, food waste - waste, responsible consumption

Key competences: Group work develops students' communication and organizational skills.

HEALTHY NUTRITION – QUESTIONNAIRE

Topic 1 Nutrients

Macronutrients include:

a. Proteins, carbohydrates, fats
b. Amino acids, glucose, fatty acids
c. Fiber
d. Vitamins and minerals
e. I don't know

Topic 2 Food as a source of energy

The highest energy value among all the nutrients they have

a. Proteins
b. Carbohydrates
c. Fats
d. Water
e. I don't know

Topic 3 Food and food groups

In the Food Pyramid or Healthy Plate, foods are organized into groups. Which group represents the base of the pyramid or belongs to the largest slice in the plate?

a. Protein-rich foods (e.g. meat, fish, milk and milk products)
b. Foods rich in starch (e.g. bread, potatoes, rice, cereals
c. Vegetables (non-starchy) and fruit
d. Water and other drinks
e. I don't know

Topic 4 Liquids, drinks and drinking regime

Which drink is the most suitable for the correct drinking regime?

a. Drinking water
b. Herbal tea
c. Milk
d. Juice
e. I don't know

Topic 5 Portions of food and drinks

How often should we eat fish?

a. Once a week
b. At least twice a week
c. Once a month
d. Fish should not be eaten
e. I don't know

Topic 6 Eating healthy

Which of the below does not belong to a healthy diet?

a. Milk
b. Nuts
c. Salad
d. Sweets
e. I don't know

Topic 7 Eating out

Which nutritional information must be listed on packaged food?

a. Content of allergens
b. Energy content, fat and saturated fatty acids, carbohydrates and sugars, proteins and salt.
c. Vitamin and mineral content
d. Lots of sugars and fiber
e. I don't know

Topic 8 Risks of improper diet

Inappropriate eating can lead to various risks and health problems. Mark the correct combination

a. Insufficient protein intake can cause an allergic reaction.
b. A person with an allergy can consume a small amount of food that contains the given allergen.
c. Diets are safe and there is no risk of nutrient deficiency.
d. Excessive and long-term intake of calories (energy) in the diet leads to an increase in body weight.
e. I don't know

Topic 9 Food safety and hygiene

For safe and hygienic eating, it is important not to consume foods that are

a. Contaminated (microbiologically, chemically).
b. In accordance with the expiration date.
c. Fortified (enriched).
d. Freshly cooked.
e. I don't know

Topic 10 Sustainable eating: food that is healthy for people is also healthy for the Earth

Which type of diet is considered beneficial for people's health and at the same time gentle for the environment?

a. Alternative eating styles (vegetarianism, veganism and others).
b. Diet with a predominance of animal foods.
c. Diet with a predominance of plant foods.
d. Eating does not affect the environment.
e. I don't know

HEALTHY NUTRITION – QUESTIONNAIRE

Correct answers. Healthy nutrition - questionnaire

Topic 1
f. Proteins, carbohydrates, fats

Topic 2
c. Fats

Topic 3
c. Vegetables (non-starchy) and fruit

Topic 4
f) Drinking water

Topic 5
b) At least twice a week

Topic 6
d) Sweets

Topic 7
g. Energy content, fat and saturated fatty acids, carbohydrates and sugars, proteins and salt.

Topic 8
d) Excessive and long-term intake of calories (energy) in the diet leads to an increase in body weight.

Topic 9
f. Contaminated (microbiologically, chemically).

Topic 10
c) Diet with a predominance of plant foods.

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Methodical guide for teachers of healthy nutrition and environmental education

Environmental education

1. ECOSYSTEM

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

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 affect her balance. Some ecosystems are constantly under 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, so it is very important that people address this topic and ensure the healthy state of all ecosystems. The following activities should explain to the students the importance of the existence of different ecosystems and at the same time make them think about their protection.

REMEMBER!

An ecosystem is a functional system of living and non-living components of the environment that interact with each other in a certain space and time. Ecosystems are divided into two types - natural (one that developed by itself without human intervention) and artificial (created by human intervention). Ecosystems can be of different sizes, but even the smallest ones form an important component of nature and it is necessary to protect and take care of them. Nature provides irreplaceable services to people, such as: the supply of food, clean air and water, the cycle of nutrients, the creation of fertile soils or climate regulation. Unfortunately, in the last few decades, biodiversity has been lost due to human influence. Environmental protection is one of the most important components for maintaining functioning ecosystems, and that is why it is necessary to focus on their renewal and growth. We can achieve this by establishing protected areas and national parks and, last but not least, by not polluting nature.

Objectives:

- Creatively display the selected ecosystem (create your own)
- Find on the Internet and assign elements to a given ecosystem
- Describe individual components and explain their function
- Present your created project,
- (describe the food chain of the given ecosystem)

Skills: Communication, information, presentation, socialization, art

Methods and forms: Group work, research, discussion, computer work

Recommended age group: 10-14 years

Time: 45-90 min.

Key terms: Ecosystem, (food chain), fauna, flora, environment.

Methodological instructions

The time estimate for the activity is 45 minutes. The theoretical part should take about 15 minutes, and the practical part should take the rest of the hour. The time required to create a poster can vary, depending on the level of difficulty chosen and the age of the students. It will also depend on the creativity and ability of the students, or even on their innovation. It is important that students work together. At the end, it is appropriate to hold a discussion on the given topic. In case it is necessary to save time or if computers are not available, it is possible for the teacher to prepare the sticky pictures in advance and bring them to the class printed. 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 process their own posters. A suitable method for solving the worksheet is a guided discussion - here 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 for them to be aware of the essence of the activities, both in the theoretical and practical parts, because it 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, and also about the influence of man on natural ecosystems and his own creation of the new ones.

Tasks

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

WORKSHEET SOLUTION:

- Briefly write what you mean by the term ecosystem? An ecosystem is a part of nature made up of living and nonliving components that interact with each other.
- What are the types of ecosystems? Natural and artificial
- Give at least 3 examples for each type Natural: desert, meadow, forest, lake Artificial: garden, quarry, field
- What is the difference between living and nonliving components of an ecosystem (give examples) Living components are for example plants and animals and non-living are climate, soil, water
- What is the main function of the ecosystem Cycle of substances
- How do we protect ecosystems? Come up with at least 5 examples. PLA, NP, international agreements and conventions, support for sustainable development, protection of endangered animals and plants, environmental monitoring
- What does nature provide to people (think of at least 3)?

Water, air, food, ... (What does the term food chain mean and what are its types?)

- Add arrows to the diagram of the cycle of the ecosystem (hint - the arrows are supposed to show the relationships between objects)

The work procedure can be simplified because the teacher will have pre-printed components of various ecosystems, from which the students can only choose and cut out. Another option is to use old natural history magazines. It is also possible to add tags with the names of selected animals and plants to the poster to ensure greater knowledge. The activity can be modified so that it can be mastered by both younger and older students. It is more appropriate to use crayons or markers to create a poster, because watercolors take longer to dry.

Key competences

When working in a group, social and personal key competences will be developed. The development of other key competencies will depend on the chosen role in the group. When searching for images and inserting them into a text document, the developed competence will be digital. Preparing a poster and cutting out individual components of the ecosystem will help develop work competence. With the help of presentation and discussion, communication competence will be developed. Interactions in group work in the context of preparing one's own ecosystem develop problem-solving competencies.

2. NATURAL RESOURCES

We often hear the topic of **energy sources** around us, especially where to get electricity in harmony with nature. If we look around, we see many devices that work on electricity. Do we need to start the washing machine in the household, fill up with fuel at the gas station, and pay in the store with a payment card? All this is just a minimal number of examples for which we need electricity. Let's face it, we depend on it and without its power we would go back several centuries.

- If we want to continue to enjoy the benefits of science and technology ej revolution and modern technologies, we cannot do without the use of electricity.
- Electricity consumption is growing despite increasing the efficiency of appliances, but where to get it in the necessary quantity and in harmony with nature?
- Maybe over time we will replace old cars with internal combustion engines for electric cars, but where will we get the extreme increase in electricity consumption?

There could be many more questions about the production of electricity, but where is the electricity produced? Surely everyone knows this, but will it be enough? And how will this production be in harmony with nature? Yes, today we have solutions that already work in harmony with nature.

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

We use different types of power plants to produce electricity:

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

You probably all know the mentioned power plants and they are located somewhere in your vicinity. Of course we have other power plants, such as surf, tidal, geothermal, etc., but do we use them here?
We don't use.

Nuclear power plants are a certain specificity nowadays. Basically, it is the splitting of atoms, during which a considerable amount of thermal energy is released. It is not a renewable energy source, but nevertheless has many advantages and considerable power. Currently, it is the only technology that is able to ensure a sufficient amount of electricity for our households, industry and possibly also electromobility and does not produce any harmful gasses, only a limited amount.

REMEMBER!

If we want to continue to enjoy the benefits of the scientific and technical revolution and modern technologies, we cannot do without the use of electricity.

With regard to nature, the best for us are power plants from renewable sources, that means also those that use natural inexhaustible resources.

Objectives:

- understand the categories of sources of electrical energy - power plants
- explain the principle of obtaining electrical energy at different types of power plants
- form a relevant opinion on the properties of renewable and non-renewable power plants
- understand the safety and technological demands of nuclear power plants.
- understand the properties of renewable sources of electricity in harmony with nature.

Acquired skills: obtaining information, analyzing the information found, critical thinking, problem solving strategy; communication; presentational.

Methods: Face-to-face teaching, group teaching; individual teaching, project teaching, teaching in pairs, discussion.

Recommended age group: 10-15 years

Time: 45 + 45 min.

Key terms: sources, production and consumption of electrical energy.

Methodological instructions

The organization is primarily dependent on the possibilities of using computing technology.

Own tasks are designed for 2 x 45 min, according to time option, it is not necessary to complete all tasks.

Face-to-face teaching, group teaching, individual teaching, project teaching, pair teaching and guided discussion.

Technical support for teaching - for the purpose of finding out information, it is necessary to use the Internet, it is possible to use a PC classroom, tablets with internet connection, or pupils' phones.

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

Activity 2: Individual contributions of students in the class, the teacher helps students with appropriate hints and directs the students' debate. Subsequently, he organizes individual drawing of a picture, with which the students can then decorate the classroom.

Activity 3: The teacher leaves the students individually to write their contributions in the table. He helps the students with suitable hints and supervises the appropriate writing of arguments in the table.

Activity 4: The teacher leaves the students individually to write their contributions in the table. He helps the students with suitable hints and supervises the appropriate writing of arguments in the table.

Activity 5: Through a guided discussion, students find a suitable place for a thematic excursion. The subsequent solution will take place according to the possibilities of the school.

Tasks

Task 1: the essence of the task is to find out what we have for electricity, how we are on this one dependent energy.

Task 2: the essence of the task is to get a basic overview of our electrical sources energy, so that students are not limited to only the sources that are currently resonating in companies.

Task 3: not only knowledge of the overview of sources, but also their properties, is important for critical students' thinking in connection with the relationship between electricity production and the impact on nature.

Task 4: the impact on nature does not always have to be only visible, e.g. smoke, but overall what a waste which source of electricity produces.

Task 5: field trip - possible implementation deepens theoretical knowledge and memorization of the subject matter experience.

Solving tasks:

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

Methodology - problem solving

Solving tasks does not have a single specific result, the information sought 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 electrical energy	Types	Advantages	Disadvantages
Renewable	Water, wind, solar and biogas power plants. Geothermal, tidal and surf power plants are atypical for Central Europe	They are basically inexhaustible, do not burden the environment, or only minimally.	
Non-renewable	Coal, gas, nuclear	High output, cheap electricity, easy regulation in the energy system, lower construction costs with the exception of nuclear power plants. Low operating costs. Apart from a small amount, the nuclear power plant no longer produces any other by-products.	They produce waste and pollute
Waste	Nuclear Power Plant	Gas Power Plant	Coal Power Plant
	Spent nuclear fuel, highly radioactive. The amount of waste is in tons per 1 nuclear block	Carbon dioxide	Carbon dioxide, slag - ash, its amount is in hundreds to thousands of tons per year

Key competences

Working in a group will develop key competences, especially social and communication skills. Furthermore, according to the concept of a specific task, there will be development of digital competence, imagination, the ability to analyze text and critical thinking.

3. RESEARCH IN NATURE - RESEARCH ACTIVITY PLAN

In this activity, students will learn to measure the amount of rain falling on the earth's surface at the school or their residence using simple rain gauges made from a PET bottle, they will try processing the measured data and calculations with them in a spreadsheet on a computer, together they will keep a digital meteorological diary long-term monitoring of temperature, air pressure and measured precipitation totals throughout the school year. From the measured data, the students will find out the framework requirements for building a simple rainwater harvesting device for watering the school garden and creating a school pond.

REMEMBER!

- Water is a basic prerequisite for the existence of life on our planet. Due to human influence, the significantly impaired ability to retain rainwater in the country and climate change in the sense of uneven temporal distribution of precipitation with long periods of drought and sudden large volumes of precipitation in a short time are potentially the biggest ecological problem of today affecting food production and their availability for 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 drives energies coming from outside the system of planet Earth in the form of electromagnetic radiation from our nearest star, the Sun. It is called the water cycle and it includes evaporation of water associated with capillary phenomena and photosynthesis taking place in plants, all meteorological phenomena including wind, water condensation in clouds, rain and snow precipitation, storms, lightning, etc. After impacting the earth's surface, then due to the force of gravity, water forms rivers, lakes, and the sea in liquid form, it soaks into the soil, where it is stored in a limited amount in the form of groundwater and reaches the roots of plants, which from water, carbon dioxide and nutrients creates organic matter in the soil when electromagnetic radiation from the Sun is supplied.
- However, there is one small hitch. When man reduces the ability of the soil to retain water through intensive agriculture and changes the landscape in such a way that rainfall only flows quickly through rivers into the oceans, plants will not be able to obtain the necessary amount of water from the water cycle for the functioning of the biosphere, and the otherwise life-giving sunlight will mercilessly destroy them. Drought gradually transforms a previously fertile landscape into an uninhabitable desert. According to current scientific knowledge, these processes are irreversible. At the same time, people have been aware of the importance of water for their lives for thousands of years and have been dealing with retaining rainwater for irrigation since ancient Babylon.

Objectives:

- understand the weather forecast;
- name meteorological phenomena;
- explain the principle of the water cycle;
- create a simple rain gauge;
- recalculate the height of the water column in the cylinder to the volume of water;
- propose a technical solution for collecting rainwater from the gutter;
- calculate the ecological balance and economic return.

Skills: problem solving strategy, planning one's own project, measurement of physical quantities, computational data processing, communication skills, presentation skills

Methods: group teaching/group work, individual work, discussion

Recommended age group: 12-14 years

Time: 90 min.

Key terms: Rainfall, rainwater retention, irrigation.

Methodological instructions

At the end of the chapter, go back to the individual activities with the students and let them summarize in their own words the specific knowledge and skill benefits of the by asking: "What new things did you learn while building rain gauges?" Which terms did you remember? Which procedures were new to you? Which activities did you enjoy?"

Pupils can reflect on the learning process in a group orally or in a notebook in writing at individual points and then hand it over to the teacher. It is also possible to use a digital bulletin board or an ordinary blackboard, where students can write their thoughts during a quick brainstorm.

Tasks

1. Reflecting on the use and meaning of the term "depreciation".
2. Types of precipitation - explanation of individual concepts (students can search on the Internet).
3. Typical precipitation totals for different intensities of rain and snow.
4. Thinking about the work procedure - the students look at the work procedure and try to determine which categories in terms of waste management the creation falls into.
5. Production of a container for collecting and measuring the amount of precipitation from residual plastic materials (PET bottles).

Methodological instructions

Activity 1: Individual contributions of students in the classroom, the teacher gradually leaves the students write your contributions on the board. The teacher helps the students with appropriate help. The teacher directs the students' discussion.

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

Activity 3: Pupils will try to find the difference between the amount of rainfall and of snow, they compare the amount of precipitation in the form of water and snow. They find out what the common aggregates are precipitation in individual months of the calendar year.

Activity 4: Pupils independently read the instructions for making a rain gauge, they can ask a briefly discuss the practical implementation. At the same time, students will find out where the waste belongs rain gauge until the product is used up.

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

A topic for a long-term project for the whole school.

DO YOU WANT TO DEAL WITH THIS TOPIC IN MORE DETAIL?

Then you will certainly appreciate the suggestions for these two activities, which are more time-consuming but very beneficial.

Garden shed with gutter and barrels

Accessories: buckets, barrels, hoses, hose couplings, plastic pipes, aluminum gutters, aluminum gutter fittings, mounting bracket for gutters, riveting pliers, laths, screws, tape measures

Optional aids: school measuring system with volume flow and liquid flow rate sensors School garden pond (biotope)

Tools: plastic sheeting or large strong garbage bags, round stones, water plants, garden tools (shovel, hoe, pickaxe, garden wheel)

CORRECT SOLUTIONS:

Chapter 3 Part A: drizzle, shower, rain, downpour, cloudburst

Formulas for calculation

1. **Circumference of the circle** O = 2πr, where OOO is the circumference of the circle and r is the radius of the circle.
2. **Area of the circle** A = πr2, where A is the area of the circle and r is the radius of the circle.
3. **Volume of the cylinder** V = πr2h, where V is the volume of the cylinder, r is the radius of the base and h is the height of the cylinder.
4. **Density** ρ=m/V , where ρ is density, m is mass and V is volume.

The density of water is approximately 1 000 kg/m^3 or 1 g/cm^3

List of different liquid containers

List of various liquid containers	Shape	Dimensions	Volume
Cups	Cylinder	Radius: 4 cm, Height: 12 cm	$V = \pi \times (4\,\text{cm})^2 \times 12\,\text{cm} \approx 603\,\text{cm}^3$
Water bottle	Cylinder	Radius: 3.5 cm, Height: 25 cm	$V = \pi \times (3,5\,\text{cm})^2 \times 25\,\text{cm} \approx 962\,\text{cm}^3$
Milk carton	Cuboid	Length: 7 cm, Width: 7 cm, Height: 24	$V = 7\,\text{cm} \times 7\,\text{cm} \times 24\,\text{cm} = 1176\,\text{cm}^3$
Cube canister	Cuboid	Length: 20 cm, Width: 10 cm, Height: 30 cm	$V = 20\,\text{cm} \times 10\,\text{cm} \times 30\,\text{cm} = 6000\,\text{cm}^3$
Coffee mug	Cylinder	Radius: 5 cm, Height: 9 cm	$V = \pi \times (5\,\text{cm})^2 \times 9\,\text{cm} \approx 707\,\text{cm}^3$

These figures are approximate and actual dimensions and volumes may vary depending on the specific design and manufacturer of the container.

Key competences:

At the end of the chapter, go back to the individual activities with the students and have them summarize the specific knowledge and skill gains in their own words using the questions: “What did you learn while building the rain gauges?” Which terms did you remember? Which procedures were new to you? Which activities did you enjoy?”

Pupils can reflect on the learning process in a group orally or in a notebook in writing at individual points and then hand it over to the teacher. It is also possible to use a digital bulletin board or an ordinary blackboard, where students can write their thoughts during a quick brainstorming session.

4. DIFFERENT TYPES OF PLASTICS AND THEIR PROPERTIES

In the theoretical part, students will review the issue of recycling in the context of material reuse and saving other resources, including individual recycling numbers. In the practical part, with the help of lids, Eurofoils and drawing aids, they will create their own game of tic-tac-toe. After creating the product, it is appropriate for the students to demonstrate their creations and describe the process and meaning of their creation. They can also talk about why the given materials are appropriate and what the overall purpose and meaning of this activity is.

The processing of residual plastic materials is one of the key components in the waste hierarchy of recycling. At the same time, it is also related to the waste of other resources. For the further processing of plastic, it is necessary to know their properties, they can be derived from the originally produced objects and at the same time according to their groups, so it is necessary to know their designation. By combining recycling and by saving other resources, new interesting products are created, which are also an active activity and lead to versatile skills. The creation of new products from residual (waste) materials demonstrates the use of recycling in practice on an individual level with available resources. However, the key factor fundamentally affecting pollution with plastic waste is the reduction in the production of plastic products and packaging materials. Recycling and reuse of plastics must be dealt with secondarily, because it is more difficult to cover the ever-increasing amount of emerging plastic waste than to reduce its amount in the context of production.

REMEMBER!

We produce various types of daily necessities, tools and packaging materials from plastics. We encounter plastics every day, for example in the form of toys, electrical engineering packaging or food storage packaging. Each plastic has a different label, this label determines not only its internal chemical composition but also its properties. Plastics can be recycled to a certain extent, but this can only be done to a limited extent, during recycling plastics degrade (lose their original properties). Therefore, quite different products are often made from recycled plastics. If recycling is ineffective for some reason, they can be used as a source of heat (electricity) during combustion. The key to reducing plastic pollution is limiting their production.

Objectives: The student can: invent possible procedures using residual plastic materials; explain individual marks used to determine the type of recycled material; create a simple product using common tools; discuss the issue of waste recycling.

Skills: Communication, information, presentation
Methods and forms: Group work, individual work, discussion
Recommended age group: 9-11 years
Time: 45 min.
Key terms: Recycling, Recycling signs, Saving resources, Residual material

Methodological instructions

The time estimate for the activity is 45 minutes. The theoretical part should take about 15 minutes, and the practical part should take the rest of the hour. In the theoretical part, it is possible to use Internet resources for group work with subsequent verification of information. The time required for the creation of Tic Tac Toes can vary, also in connection with the chosen difficulty of the creation. It will depend on the creativity and ability of the students, or even on their innovation. Work safety when handling sharp tools is also important here. At the end of the activity, it is advisable to hold a discussion with the students on the given topic, including checking the worksheets together with the demonstration of individual products. For testing, including review and discussions, I recommend two teaching hours. In the theoretical part, it is not so important that the students answer everything correctly, but that they familiarize themselves with the given labels and terms, and that they try to be creatively involved in inventing possible types of other products. At the same time, they should also be aware of the essence of the activities, both in the theoretical part and in the practical part, because it is not only about recycling, but also about the preservation of other resources that are normally used in this activity, and one could say that they are being wasted. specifically with paper. In the work process, we can also skip the paper itself and draw a square grid directly on the foil, for this procedure I recommend using a permanent marker and a harder foil. At the same time, the creation of figures is left to the students' creativity. The simplest possible principle is indicated in the work procedure, but the students can freely improve the figures and the square network at their own discretion. The activity is therefore modified so 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 adjustments using other possible materials. When using drawing aids, higher quality alcohol markers are more suitable, ideally permanent. Based on this chosen principle, several games of a similar type for several players can be produced. For example, Man, don't be angry, Checkers or Chess.

Plastic marking solution

1 PET (PETE) Polyethylene terephthalate/2 HDPE (PE - HD) Polyethylene with high density/3 PVC (V) Polyvinyl chloride/4 LDPE (PE - LD) Polyethylene with low density/5 PP Polypropylene/6 PS Polystyrene/7 - 19 Other plastics, e.g. polycarbonate (PK), polyamide (PA), acrylonitrile butadiene styrene (ABS), styrene-acrylonitrile (SAN), bioplastics.

Key competences

During the implementation of the project, students will primarily develop the key competence of work. They will practice working with materials, tools and equipment, they will follow the rules for work safety and they will practice working according to the work procedure. Various complications can arise during production, so students can indirectly develop their competence to solve a problem. In the theoretical part, students develop their digital competence when searching for information on different types of plastics. If they work together in groups, they will also develop the key competence of communication. The content of the project itself develops key civic competences in the context of basic understanding of ecological context and environmental problems.

5. HOW TO PROTECT THE ENVIRONMENT

In the theoretical part, students will review basic concepts from the field of ecology and learn the principles of environmental protection at the individual and communal level. In the practical part, they will learn to calculate their ecological footprint, determine which human activities have the greatest impact on the environment, find out what the energy consumption of household operations depends on, what is the energy consumption of personal transport and production processes, various methods of freight transport and storage of goods, and how to improve them efficiency. At the end, students propose their solutions to current civilizational problems, present them in the group and discuss them together.

REMEMBER!

You don't have to throw everything you no longer need into the trash. A range of products can be repaired, donated or creatively repurposed. Even a broken thing can still bring joy and knowledge.

Objectives:

- names the main ecological problems of today;
- understands the impact of his behavior and behavior on the environment;
- is aware of the consequences of his consumer behavior;
- finds the necessary information and numerical data on the Internet;
- propose a technical solution to reduce waste production;
- explain the principles of transformation of different forms of energy;
- understands what energy efficiency depends on;
- calculates the energy consumption of devices in the home;
- describe individual components of devices and explain their function;
- cooperates with others in the group;
- presents part of a joint project;
- defends his opinion using factual arguments;
- accepts constructive criticism;
- can learn from both successful and unsuccessful solutions

Skills: searching and sorting information; categorization of information; assessing the credibility of information; analytical and critical thinking; calculation based on the detected data; order estimation of quantities; development of social skills; taking responsibility for part of the tasks in the group, communication in the group; presentation of results in the group;

Methods: project teaching; heuristic teaching method; research activities; use of computers for calculations and data visualization; self-organization and self-motivation; group work; argumentation and discussion;

Recommended age group: 13-15 years.

Time: 45 min per activity

Key terms: Local food, Direct recycling, Household energy requirements

Methodological instructions

The time estimate for the mentioned activities is one to two teaching hours (45 minutes each). Pupils work autonomously in groups under the teacher's supervision according to assigned tasks and instructional questions. It is possible to divide the class into groups, where each group solves a part of the whole lesson and then presents the result in front of the class.

Tasks

1. Reflecting 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 different 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 the electrical input 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 the classroom, the teacher gradually leaves the students write your contributions on the board. The teacher helps the students with appropriate help. The teacher directs the students' discussion.

Activity 2: Pupils can look up the meaning of individual terms on the Internet. As possible schools, it is possible to work alone, in pairs, or students can use their phones.

Activity 3: Pupils find out the properties of used packaging materials. Information can get on the internet. Depending on the possibilities of the school, it is possible to work alone, in pairs, or possibly students can use their phones.

Activity 4: Pupils determine the durability of food in the context of different types of packaging materials, storage and transport. They can get information on the Internet. It is possible according to the possibilities of the school work alone, 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 way. They can use paper and pencil, but it is also possible to use the electronic method, computer, telephone.

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

Activity 7: Pupils can try to implement a school exchange, where it is possible, for example, by donating or by exchanging old and unnecessary things to give a "second chance" for their reuse.

Activity 8: Pupils can look up on the Internet what the power consumption of the device means and they can compare individual appliances with each other with regard to their efficiency. As possible schools, it is possible to work alone, in pairs, or students can use their phones.

Activity 9: Pupils will find technical data about the consumption of a car and calculate how much it will be fuel consumption - as a result, how much and what kind of financial costs will they need for such a trip.

They will proceed in the same way when making the same journey by mass means.

They will use the Internet to find the necessary information. Depending on the possibilities of the school, it is possible to work individually, in pairs, or students can use their phones.

CORRECT SOLUTION

Activity 1: *Which foods have the longest shelf life? Why?*

In which packages do foods have a long shelf life and why?

Find out online how much energy is needed to produce 1 kg of paper, 1 kg of plastic, 1 kg of steel and 1 kg of aluminum sheet.

Find out on the Internet how much carbon dioxide is produced in the production of 1 kg of the above-mentioned materials.

Foods with the longest shelf life and why

Some foods have a very long shelf life due to their natural properties or the way they are processed. These include:

1. **Honey** – Practically unlimited shelf life due to low water content and high sugar content, which prevents the growth of bacteria and mold.
2. **Dried legumes and cereals** – Long shelf life (up to several years) due to low water content.
3. **Rice** – White rice can last for decades as long as it is stored in a dry and cool place.
4. **Sugar and salt** – They do not spoil due to the fact that they are natural preservatives.
5. **Canned foods** – Many years of shelf life thanks to the preservation process, which destroys bacteria and hermetically seals the food.
7. **Frozen foods** – Long shelf life (up to several years) with proper storage at low temperatures.

Packaging for a long shelf life of food and why

1. Glass - Hermetically sealed, chemically inert, prevents the penetration of oxygen and contaminants.
2. Metal cans - Vacuum packaging or filling with a protective atmosphere, high resistance to mechanical damage.
3. Plastic packaging - Highly flexible, can be airtight, often used for vacuum packaging.
4. Aluminum foil and foil - Barrier properties against moisture, oxygen and light.
5. Tetra Pak - A combination of paper, plastic and aluminum, ideal for liquid foods, provides protection from light, air and bacteria.

Energy required to produce 1 kg of different materials

1. **Paper** – Approximately 7,5 - 10,0 MJ/kg.
2. **Plastics** – Approximately 62 - 108 MJ/kg (depending on the type of plastic).
3. **Steel** – Approximately 20 - 30 MJ/kg.
4. **Aluminum** – Approximately 200 - 250 MJ/kg.

Production of carbon dioxide in the production of 1 kg of various materials

1. **Paper** – Approximately 0,7 - 1,0 kg CO_2/kg.
2. **Plastics** – Approximately 2 - 3,5 kg CO_2/kg (depending on the type of plastic).
3. **Steel** – Approximately 1,8 - 2,0 kg CO_2/kg.
4. **Aluminum** – Approximately 9 - 12 kg CO_2/kg.

Reasons for differences in energy intensity and CO_2 production

- **Paper:** Production involves mechanical and chemical wood processing processes, which is less energy intensive than metal or plastic production.
- **Plastics:** Production involves processes of chemical synthesis from oil or natural gas, which is energy intensive.
- **Steel:** Production requires smelting of iron ore, which is energy intensive, but less so than aluminum.
- **Aluminum:** Production involves the electrolysis of bauxite, which is very energy intensive and causes high CO_2 emissions.

These figures may vary depending on the specific technologies and energy sources used in different factories and regions.

Activity 5 – *Find CO_2 emissions data for the type of fuel used (gasoline, diesel, LPG). Recalculate the amount of fuel burned into the amount of carbon dioxide produced using the table editor. …… km per week …… liters per week …….. g CO_2 per week*

Emission factors for commonly used fuels:

- Gasoline (Petrol): Approximately 2,31 kg CO_2 per liter
- Diesel (Diesel): Approximately 2,68 kg CO_2 per liter
- LPG (Liquefied Petroleum Gas): Approximately 1,51 kg CO_2 per liter

To calculate the amount of fuel burned for the amount of carbon dioxide produced, we will use a table editor (for example, Excel)

Example of calculation in Excel:

- Fuel type: Gasoline
- Fuel consumption: 50 liters per week
- Emission factor: 2,31 kg CO_2/liter
- CO_2 emissions: 50 × 2,31 = 115,5 kg CO_2 per week
- CO_2 emissions: 115,5 × 1 000 = 115 500 g CO_2 per week

Similarly, you can calculate CO2 emissions for diesel and LPG, using the relevant emission factors and fuel consumption.

Key competences

When working in a group, students develop social skills. In both individual and group work, he develops the skills of problem solving, information search and orientation in a large amount of data, sorting of information, analytical and critical thinking.

PAfter the lesson, students will realize how much waste is produced during food production. At the same time they will learn what to do with the generated waste. They will also learn how not to create new waste by repairing materials and recycling used items.

Through critical thinking while monitoring the amount of energy consumed, they will come up with ways to save energy.
By monitoring the carbon footprint of their home car, they will realize that by using other modes of transport, or moving by bicycle or on foot, they will reduce their carbon footprint.

6. SORTING AND RECYCLING

If we want to entice students to the topic, they can take a picture of their own open refrigerator at home. During the first, theoretical part, students will clarify the breadth of the issue of waste sorting with the help of a questionnaire and practical examples from their own surroundings. They will see what containers are around them and with the help of the Recycling Bins in UK activity they will realize the difference in different countries. At the conclusion of the theoretical part, it should be emphasized that the ideal is not to create waste, but to recycle or upcycle it. In the practical part, students will take on the role of an extreme minimalist. At the end, in groups (ideally in pairs), they will try to create a simple product from commonly available recyclable materials, which they will present and evaluate both the idea and the execution together.

Waste can be divided according to various criteria: according to origin, state, degree of danger, etc. For the purposes of this project, we will be interested in dividing by usability. Recycling waste materials should be part of our daily routine. For example, in the Czech republic, on January 1, 2021, several laws that focus on the future of waste management came into force. The intention is to gradually increase fees for landfilling until it is completely eliminated by 2030. The goal is to sort more and after 2035 recycle 65%, use 25% as energy and export a maximum of 10% of the total municipal volume to landfills *(Note: Local data can vary. We reccommend teachers to search for the local data of given country. Although the laws in European Union are very similar)*. Waste management is a matter that every individual can influence with their behavior. One Czech produces more than half a ton of municipal waste per year, as shown by the data for 2021. It is necessary to spread awareness of proper waste management and adopt the so-called the 3R rule (Reuse, Refuse, Recycle), which aims to reduce the amount of municipal waste. Reuse - we reuse what can be used and do not buy new. Refuse - let's learn to refuse, let's not be tempted by buying unnecessary or inappropriately packaged things. Recycle - let's recycle, let's sort correctly.

In the modern world, the emphasis is on minimalism and upcycling. Upcycling is a process where we modify unused products or waste materials and find a new use for them. It is often an art used in design. Especially with light metals (cans, cans), this trend is welcome and there are many tips for making decorations as well as practical home or garden accessories.

REMEMBER!

The European Union aims to reduce waste materials and emissions and uses various laws to do so. Every individual can help the environment by sorting waste correctly. A person's primary goal is not to produce waste, and in the case of already produced waste, it is necessary to introduce a solution for its repeated use in the form of recycling/upcycling and overall reduction (rule 3R: Refuse, Reuse, Recycle).

Objectives:

The student can: understand the concepts of recycling, upcycling, minimalism, waste materials; discuss the importance of classification and the importance of individual decisions; monitor your surroundings, distinguish and sort waste materials; argue and look for a solution; and promote the importance of waste reduction and recycling.

Skills: communication; organizational; active listening and argumentation.

Methods and forms: group work or work in pairs; discussion / discussion; game; project and project organization.

Recommended age group: 12 years

Time: 45-60 min.

Key terms: Waste management, Rule 3R (Refuse, Reuse, Recycle), Minimalism, Upcycling, Waste sorting, Municipal waste

Methodological instructions

The chapter presents a number of activities, the selection of which can be combined to suit the time possibilities and needs of the teacher. The basic recommended scheme is as follows. 1. Pupils will be given the task of preparing photographers and refrigerators. 2. During the lesson, the theoretical part will take place first (30 min in total). 3. Projects are presented and one is selected using a quick vote. 4. The Minimalista game can be played until the end of the lesson. 5. A month with a selected project follows, which can be followed up by a compost project the following month, see chapter 7 on the topic of bio-waste. The main goal is to awaken students' responsibility for their own waste footprint and to encourage them to find solutions aimed at proper sorting and especially waste reduction.

Methodical instructions - my refrigerator

The time estimate for the activity is 10-15 minutes, suitable home preparation.

We recommend sharing refrigerators anonymously, e.g. to the class portal or students showing them to each other so that in small groups, not even in pairs, as many students as possible were involved in the discussion, while the teacher goes through and corrects opinions, or helps resolve disagreements. It is necessary to draw attention to the whole range of waste containers and to 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 linked with a sample map showing the location of waste containers in your neighborhood (see chapter 7, brainstorming section).

Methodical instructions - the moon in the basket

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

Key competences:

Individual preparation aimed at realizing a critical situation. Group work in the theoretical and practical part will develop students' communication and organizational skills. During the preparation and the course of the projects, practical competences will be developed - listening, argumentation, presentation, evaluation. In addition, the information obtained can be practically applied across the selected subjects

7. BIOWASTE

In the introductory part, students will review the issue of waste sorting (see chapter 6) and focus on bio-waste. They become aware of the lack/availability of containers in the immediate vicinity and discuss how and what organic waste they sort, if at all.

In the practical part, in groups (ideally in pairs), they will try to create a simple, homemade compost from commonly available recyclable materials. The students will ideally take the created product home and after about a month they will recapitulate the topic and evaluate whether the composts work, how they look, whether they smell and how we can further use the material.

Biowaste is an abbreviated name for biodegradable waste. These are organic residues from households or gardens. Bio-waste makes up around 40% of the weight of all discarded waste, and it often ends up in municipal waste rather than in the brown bins intended for it.

From the point of view of the circular economy, biowaste is a very promising material that could be used as a fertilizer or even a source of energy (e.g. electricity, gas). First of all, you need to focus on proper sorting and composting.

Bio-waste can be composted in a vermicomposter using earthworms, in classic garden compost or shared compost with neighbors. These places and brown dustbins are always a better choice than municipal waste, an incinerator or a landfill, where greenhouse gasses are produced due to the lack of air.

REMEMBER!

Bio-waste is biodegradable waste. It is in the company's interest to focus on its sorting and use composters, vermicomposters or brown containers. Why don't we want bio-waste to end up in landfills? Because it would decompose there without air access. Greenhouse gasses (methane) would be released, odors would arise, and the decomposition process would take longer. Another fact is the growing volume of landfills.

Compost includes organic waste of plant origin (fruit and vegetable peels, leaves), on the other hand, animal waste (meat, bones), oils, diapers, etc. they have nothing to do with bio-waste.

Objectives:

- understand the concepts of recycling, compost and others;
- discuss the importance of sorting biowaste, reducing its generation and recycling;
- observe your surroundings, recognize containers for sorting and bio-waste at home and at school;
- upcycle a pet bottle and use it to create simple compost.

Skills: communication, organizational, active listening and argumentation

Methods: pair/group work, instruction, experiment, conversation/discussion, didactic games

Recommended age group: 11-14 years

Time: 2x 45 min.

Key terms: Biowaste, Recycling, Degradability, Composter, Vermicomposter

Methodological instructions

The chapter offers activities to choose from so that the total subsidy does not exceed the duration of two 45-minute lessons. Both the introduction and the conclusion should summarize important knowledge related to biowaste, and after working together, 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 about 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 grounds, the students would ideally build a larger bio-waste composter.

Methodological instructions - activity 1 quiz

The time estimate for the activity is 15 minutes.

We recommend using a playful method to involve as many students as possible at once (Kahoot or Wordwall race - students can start it on a mobile device via a QR code), or make it like a classic paper dotazník and emphasize that this was not exactly ecological.

Correct answers:
1) brown (in the Slovak Republic, but in other countries it can also be green)
2) 40% (details at mzp.cz in the Biological Waste Management Study from 7/2023)
3) 1/3
4) do not produce waste
5) earthworms (other types of decomposers: centipedes, roundworms, mites, roundworms, etc.)
6) methane

The introduction to the topic can be frontal at the beginning or right at the end and summarize the information from activities.

Methodical instructions - activity 3 composter

- Time estimate for the activity is 30 minutes, work in pairs/groups.
- We recommend intersubject linking with English and showing a video, or showing an already finished sample of the product.
- Here is the QR video
- It is advisable to project the procedure head-on or let them use mobile devices with 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 bio waste bin due to operating regulations. It is a waste of animal origin. Egg shells can be used for example as a source of calcium for plants.
- We constantly emphasize the benefits of a home composter (remember).

Methodological instructions - cross-curricular activities

Here is a list of suggestions for cross-curricular activities, each approx. 15 min.

Art Education: description of pictures in pairs, groups, maybe even creation using AI
- works by G. Arcimboldo or J. Švangmajer
- password food art

English language: work with vocabulary, own presentation suitable activity What does not belong in bio/ waste (worksheet or Wordwall)

Mathematics: on the Slovak pages of mojeco2.sk, choose calculate consumption, box to the right, fill in and compare (with each other, average, percentages, frequency, ...)

Chemistry: project on Greenhouse gasses (Kyoto protocol, greenhouse effect)

Key competences

Group work in the theoretical and practical part will develop students' communication and organizational skills. During the solution of the quiz and during the subsequent work, an important competence will be developed - listening and the acquired information can immediately be used for the argumentation of opinions and ideas.

8. MINIMIZING WASTE, SAVING HOW TO PRESERVE WATER FOR NEXT GENERATIONS

The waste management hierarchy is a key aspect of waste management. If we follow its principles, it will lead to a reduction in the total production of waste in society. The creation of new products from waste materials then demonstrates the use of recycling in practice on an individual level.

In the theoretical part, students will remember the issue of the waste hierarchy with terminology in English and explain the individual principles. In the practical part, he creates his own Jojo using a melt gun and plastic lids. After creating the product, it is appropriate for the students to show Jojo to each other, and as part of the demonstration, it is appropriate to hold a discussion with the students on the importance of recycling and other possible products from waste materials.

REMEMBER!

A well-applied hierarchy of waste management has a positive effect on the reduction of waste generation, and ensures conditions for its reuse and recycling. It determines the possibilities of other (e.g. energy) utilization of waste and also solves its eventual disposal. Effective management of these principles has a positive impact on the environment and the amount of waste.

Objectives:

The student can: translate concepts from the field of waste hierarchy, explain individual principles of waste hierarchy, create a simple product using a glue joint with a hot melt gun, and discuss the issue of waste recycling.

Skills: Communication, presentation

Methods and forms: Group work, individual work, discussion

Recommended age group: 9-11 years

Time: 45-60 min.

Key terms: Hierarchy of waste, Recycling

Methodological instructions

The time estimate for the activity is 45 minutes. The theoretical part should take approximately 10-15 minutes, and the practical part should take the rest of the hour.

However, the time required for the practical part (making Jojo) can vary greatly. It will depend on the size of the group, the year and the abilities of the pupils. At the end of the activity, it is advisable to hold a discussion with the students on the given topic (with a possible check of the worksheets with the theoretical part) together with the demonstration of the individual products.

In the theoretical part, the exact translation is not important, but rather the meaning of the terms. If the students have not yet encountered the topic of waste management (waste hierarchy), you can suggest to the students that the term refers to the image of a pyramid. If you deem it appropriate, students can work on the worksheets from the beginning in pairs or other groups (especially if the topic is really new to them). You can also allow students to use the Internet.

In the pyramid, only the order is important, so there are two possible solutions (according to the importance of understanding the base and the tip of the pyramid). In order to complete the theoretical part, it is necessary that the students already have a work procedure with pictures available. In the workflow, you can use, for example, a nail instead of scissors in point 2. Pay extra attention to work safety in this step!

In point 11 to 14 (formation of blinds) it is visual rendering, Jojo will work even without blanks and beads. 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 dowel, screw washer, etc. (Other alternative instead of JoJo is any moveable toy, where the lids can be used for example as the wheels).

Key competences

After completing the project, students will be able to use selected residual plastic materials to create simple interactive products. They will understand the basic components of the Waste Hierarchy and understand individual concepts such as reduction, reuse, prevention, recovery, dispose, recycle.

9. BUSINESS FROM THE VIEWPOINT OF ECOLOGY

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 then create a map of the world divided into the given continents, which will display 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.

With regard to current trends, more and more pressure is being exerted on ecological business - the so-called green business. This is especially the case in Europe, North America and some countries in Asia. This type of business has the task of creating a concept for an ideal zero burden on the environment. At the same time, green business also includes social impacts in its concept, thanks to which it tries to contribute to economic and social development in the world. There are several ways to determine the ecological productivity of countries around the world and, thanks to this, to single out those countries that have the biggest and the smallest problem with ecological business. However, it is important to realize the critical situation in some countries and its subsequent impact on the environment. The following activities should explain to the students the importance of ecological business and at the same time acquaint them with real data.

REMEMBER!

Ecological business, also known as green business, is not only a trend of today's time, but it is also very important for maintaining a healthy environment, and thus it is very fundamental for our better future. The task of green business is to create a concept that is supposed to reduce the environmental burden. This means that it tries to ensure that the business has minimal, ideally zero, impact on the environment. One of the main tasks of ecological business is the effort to reduce production waste and also reduce harmful emissions. At the same time, however, it also deals with the effects on humans. This means that it tries to contribute to social and economic development and the creation of quality conditions for work. The green economy tries to change the existing linear economy to a circular economy.

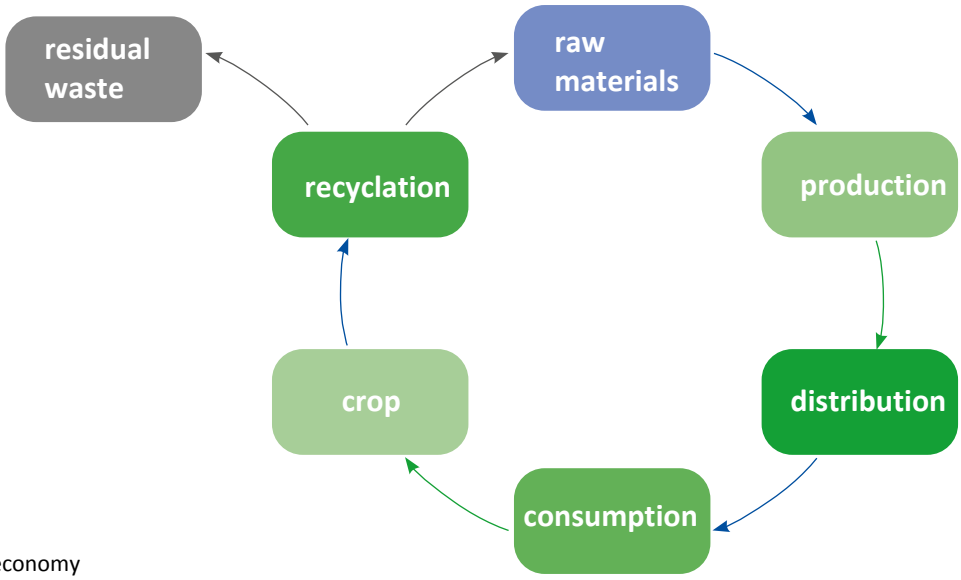

Figure 2 – Circular economy

It is important, even as an individual, to contribute to the improvement of the environment, and thus to use as many ecological business products as possible. We can do this, for example, by wearing eco-friendly clothes; washing when the washing machine is full and using the correct detergents; in cities, prefer public transport over private cars or cycling; encourage composting and recycling; ... And last but not least, it is very important to verify information. It is ideal to really look to see if a company or brand that pretends to be "green" really is.

Objectives:

Critically decide on the ecological intention of different countries, or continents; find answers to critical questions about the topic on the Internet; describe the habits and ecological thinking of individual parts of the world; present your created project. to work cooperatively with their classmates.

Acquired skills: communication; informative; presentational; socialization; digital.

Methods and forms: group work; research; cooperative; computer work.

Recommended age group: 12-15 years

Time: 45-70 min

Key terms: Ecology, business, business in the world.

Methodological instructions

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 the world part 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 students work together. At the end, it is very appropriate to hold a discussion on the given topic. It is also advisable that the students draw lots and not choose the given continents. 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 knowledge gained from activity one is group discussion. At the same time, it is very important for them to be aware of the essence of the activities, both in the theoretical part and in the practical part, because it is not only a view of the individual problems of the continents, but a global mindset about ecology as such and also the impact of man on the environment. The solution to partial worksheets is a very individual one and there is not always one right answer. The workflow can be modified in several ways. If there is enough time, students can complete the theoretical part on school computers/tablets (if the school has them). In the same way, each group can draw the entire continent by itself in the previously mentioned scale. If, on the contrary, 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. In the attachment you will find a map of the world divided by continents.

Key competences

When working in a group, key social and personal and communication competences will primarily be developed. In the theoretical part, the digital key competence will be developed the most, followed by the problem solving competence. During the creation of the map, work competence will also be developed.

10. THE RELATIONSHIP OF NATURE AND CIVILIZATION

When walking in nature, we certainly notice wild animals. We can meet many species here. The red deer is probably the most famous, but also the European red deer, the red fox, the red wolf, the wild boar and many other species. Last but not least, it can also be a brown bear, which can be dangerous for us humans.

REMEMBER!

- Wild animals are shy, as a rule they avoid all people.
- In nature, we must behave quietly, especially in spring, when we can even meet young animals, most often deer
- We may come across animal tracks, usually footprints on the ground.
- If we behave quietly in nature, we can catch a glimpse of some species, usually in the pasture.

We can see wild animals not only in the zoo, but also in the wild if we behave quietly. As a rule, wild animals do not have a natural enemy in the form of a predator, so it is necessary to regulate their quantity. For these purposes, we have hunters who regulate the numbers of wild animals through controlled hunting. At the same time, people significantly influence the natural structure of the diet, which animals can find on their own in nature. For this reason, especially in the winter months, some types of game must be fed.

Objectives:

- knowledge of wild game species
- identification of different species of game
- the relationship of man to wild species
- knowledge of behavior in nature
- the importance of hunting

Skills: obtaining information, analyzing the information found, critical thinking, problem solving strategy, communication, presentation

Methods: Face-to-face learning, group learning, individual learning, project learning, pair learning, discussion

Recommended age group: 10-15 years

Time: 45+45 min.

Key terms: nature, game species, tracks, feeding, game care

Methodological instructions

Activity 1: Individual contributions of students in the classroom, 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' discussion.

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 footprints 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 animal and the track.

Activity 4: The teacher leaves the students individually to write their contributions in the table. He helps the students with appropriate advice and supervises the appropriate recording of 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.

Tasks

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

Task 2: students can name wild animal species in our environment based on appearance.

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

Task 4: students can determine what to supplement the animal's natural diet, especially in times of suffering - winter.

Task 5: field trip - possible implementation deepens theoretical knowledge and memorization of the subject matter experience.

Solving the tasks

Mouflon

Red deer

Wood badger

Red fox

Brown lynx

Red wolf

Brown bear

Pheasant

Wild boar

Key competences

Working in a group will develop key competences, especially social and communication skills. Further, according to the concept of a specific task, there will be development of digital competence, imagination, the ability to analyze text and critical thinking.

ENVIRONMENTAL EDUCATION – QUESTIONNAIRE

Topic no. 1 Ecosystems

How do we divide ecosystems?
a) natural and cosmic
b) natural and artificial
c) natural and artificial
d) I don't know

Topic no. 2 Natural resources

Which of the listed power plants has the least impact on the environment?
a) nuclear power plant
b) gas power plant
c) coal-fired power plant
d) I don't know

Topic no. 3 Research in nature

In what units is the amount of rainfall indicated?
a) liters per second
b) meters per second
c) millimeters per hour
d) I don't know

Topic no. 4 Different types of plastics and their properties

What material loses a key property during recycling ti and it can only be recycled limited?
a) Glass
b) Iron
c) Plastic
d) I don't know

Topic no. 5 How can I protect the environment?

What waste material can be used to repair shoes?
a) impregnated paper carton
b) a worn tire from a bicycle
c) an empty PET beverage bottle
d) I don't know

Topic no. 6 Sorting and recycling + waste processing (what and how to recycle)

Odpadové hospodárstvo pracuje s tzv. pravidlom 3R (Refuse, Reuse, Recycle). Čo je primárnym cieľom človeka?
a) odpad triediť
b) odpad recyklovať
c) odpad neprodukovať
d) neviem

Topic no. 7 Organic waste

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

Topic no. 8 Waste minimization

What is most important (most significant) for reducing plastic pollution of nature wastes:
a) recycling of plastics
b) reduction of plastic production
c) reuse of plastics
d) I don't know

Topic no. 9 Business from the point of view of ecology

What has the so-called been trying to do lately "green economy"?
a) stop using heavy machinery and go back to the Middle Ages
b) change the recycling policy by enacting waste sorting
c) transform a lot 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

Topic no. 10 The relationship between nature and civilization

What does the term track mean?
a) the place of the animal print in soft soil or snow
b) a regular resting place for animals
c) place of bite of young trees
d) I don't know

CORRECT ANSWERS

Topic 1 Ecosystems
b) natural and artificial

Topic 2 Natural resources
a) nuclear power plant

Téma 3 Výskum v prírode
c) millimeters per hour

Topic 4 Different types of plastics and their properties
c) plastic

Topic 5 How can I protect the environment?
b) a worn tire from a bicycle

Topic 6 Sorting and recycling + waste processing (what and how to recycle)
c) do not produce waste

Topic 7 Organic waste
b) methane

Topic 8 Waste minimization
b) reduction of plastic production

Topic 9 Business from the point of view of ecology
d) transform the current linear economy into a circular one and thereby reduce the amount of waste

Topic 10 Relationship between nature and civilization
a) the place of the animal print in soft soil or snow

METHODS AND ORGANIZATIONAL FORMS OF TEACHING

Teaching methods belong to the basic elements of teaching. With the help of teaching methods, the content of the subject matter is communicated to the students. During teaching, there is constant interaction between teacher and student or between students. 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, mostly classical teaching methods such as explanation or lecture were used. Today, teachers already use many non-traditional teaching methods that involve students in the very act 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.

Organizational forms of teaching represent the organized activity of students and the teacher, which takes place in a certain time, space and according to a plan.

Classification of organizational forms of teaching:

a) according to the environment:
- teaching in the classroom
- teaching in specialized school premises (computer classroom, laboratory)
- teaching outside the classroom (e.g. in nature, in a museum)

b) according to the number of pupils
- face-to-face teaching (the whole class learns at the same time)
- group teaching
- individual teaching

1. Group work

The importance of group teaching is that students solve joint tasks and problems, exchange opinions, complement each other, help each other, jointly take responsibility for work results, etc.

The indicator of the effectiveness of group work is not the results of groups, but the results of individuals.

Advantages and disadvantages of group teaching

Advantages	Disadvantages
Increasing interest in the subject, learning	Time consumption in preparing the lesson
Active learning is learning	Noise in the classroom
Responsibility for group activity/for own work	With a large number of groups, the teacher can lose track of their activity
They will learn to plan their work/time efficiency	Uneven number of students in the group in the absence of students in the class
Respecting the other members of the group	Refusal of the activity in case of bad distribution of pupils (I am not with a friend in the group)

The most ideal number of students in a group is 4.

a) Types of groups:

Natural groups - voluntary selection of pupils

Dating groups - getting to know new students

Short-term groups - most 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 of different levels of task mastery

b) How to create groups of pupils:

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

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

c) Examples of random division

- Pens - pupils put their pens in a cup - the pens are randomly drawn and form groups
- Names - tickets with the names of the pupils that we draw
- Puzzle – we cut the picture into parts, the students draw lots and find with whom they can put the picture together
- Heroes – we distribute 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 different variations: names of famous personalities, pictures, geometric figures, songs, years and events, etc.)

Tip: make raffle tickets that you will use all year

Comparison of group and cooperative teaching

Group teaching	Cooperative teaching
Social skills are not considered	Targeted development of social skills
The teacher does not intervene in the group work.	teacher observes the work and intervenes if necessary
The main activity is led by the teacher or a chosen student	Joint management of the activity by all students
The pupil is responsible only for himself	Responsibility for the whole group

Examples of group and cooperative teaching techniques

- Controlled discussion
- Step-by-step discussion
- Buzzing groups

- Snow globe
- Crossed groups
- Mind map
- Jigsaw puzzle or Circle of experts
- Aquarium

2. Project teaching

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

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

The essence of project teaching is the solution of the created or of the problem raised by students in the form of a specific project.

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

3. Role-playing game

A role-playing game represents a certain situation, where the solution is implemented in the form of playing a role. We use it when practicing communication and social skills, when we want students to experience different situations and see them from multiple perspectives. Role playing helps students to 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 a role-playing game is playing a story, a situation. The story can be invented or created based on a template. It is essential that the story has its gradation, educational potential and appeal to the students of the class.

A role-playing game requires very competent guidance from the teacher due to the significant psychological burden on the participating students.

Role-playing usually takes place in the following phases:

a) familiarization with the situation
b) division of roles
c) preparation and practice
d) acting out the situation by the group
e) evaluation and evaluation of conclusions from the played game

4. Research teaching

IBSE-Inquiry based science education - teaching based on research
Research teaching is not a defined teaching method, but contains elements of several teaching methods, e.g. problem teaching, project teaching. In exploratory teaching, the teacher does not present ready-made knowledge and only acts 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 get involved in the way of thinking of scientists 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 person. Man constantly observes a number of objects, phenomena and processes in his surroundings. Based on observations, scientists ask themselves questions ("research" questions) to which they seek answers. As part of their search for answers, they establish hypotheses and plan experiments to confirm or refute their hypotheses

Types of research teaching

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

Advice to teachers on how to implement research-based teaching

- Thorough preparation before the lesson is important
- Do not assign tasks that are too difficult in the beginning.
- Every student should have his research record.
- Consider working in groups.
- Be careful not to interfere with the students' research.
- Tell the students that the assessment will be for the whole work and not just for 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 research activities.
- Devote sufficient time to presenting the students' results.

Procedure in research teaching

In research teaching, the student gets into the position of researcher and author of new knowledge. The discovery of new information is the basis of the students' work.

In research teaching, it is important to follow the procedure

a) Asking questions: asking an interesting question. We ask students questions without waiting for an answer or students ask questions to the teacher.

b) Choosing a research question: Students choose a question to which they will look for answers
c) Hypothesis formulation (first together with the teacher, later independently): Pupils try to think and create their own hypothesis - the assumption of an answer to the question posed
d) Experiment – searching for answers to questions, confirming or refuting a hypothesis based on information obtained from the Internet or professional literature.
e) Presentation of results: next hour, no more than 3 min/student