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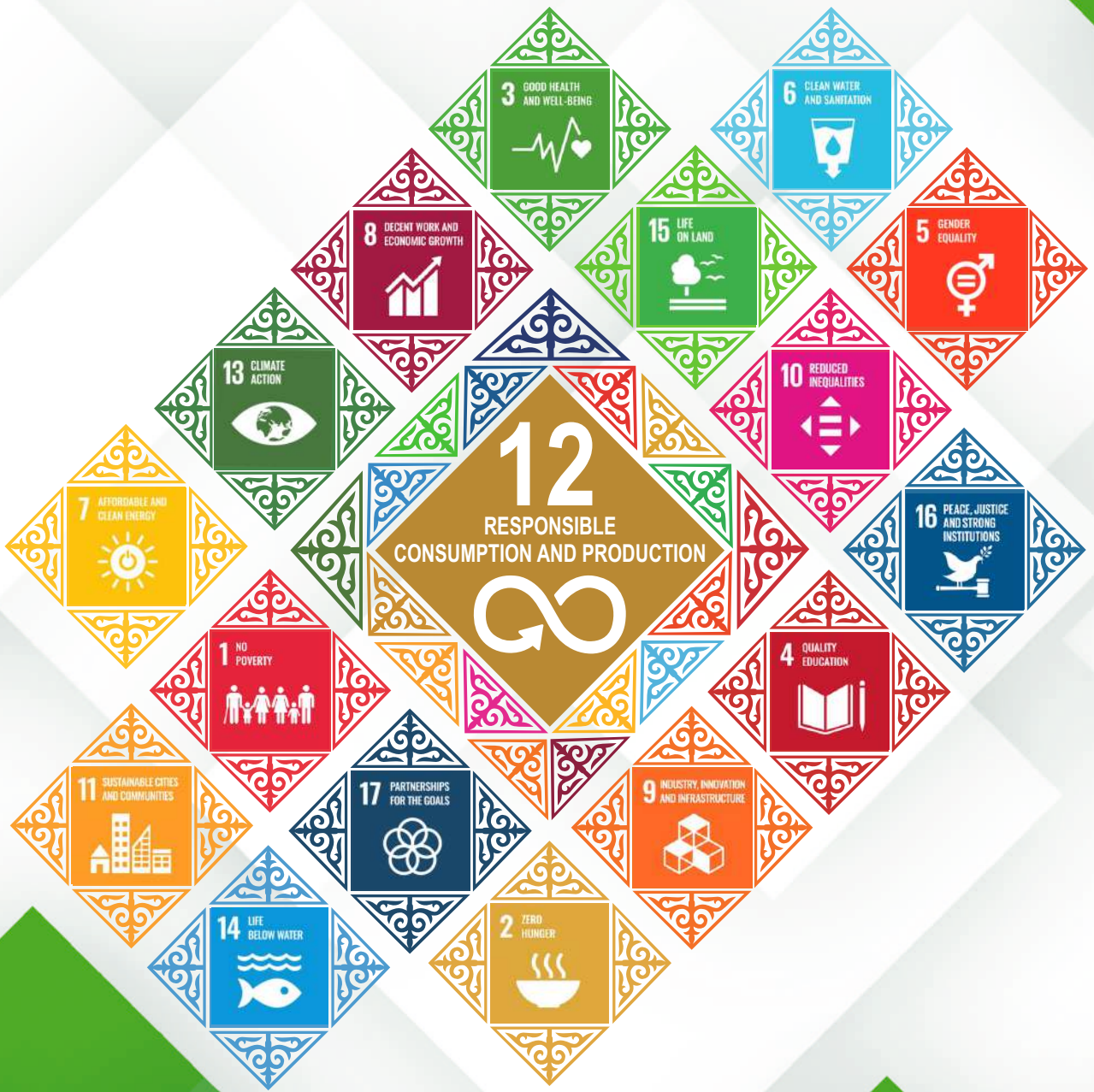
RESPONSIBLE CONSUMPTION AND THE ENVIRONMENT

METHODOLOGICAL GUIDE FOR TEACHERS



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O-80 Responsible Consumption and the Environment: A Responsible Consumption Study Guide for school clubs and extracurricular activities, as well as additional material./ Comp. Duishenova J.K., Dzhunushalieva K.K., Mambetakunov U.E. B.: 2020.- 44p.

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The proposed methodological guide for teachers "Responsible Consumption and the Environment" is designed for subject teachers, class teachers, and school club teachers on the application of the principles of Education for Sustainable Development (ESD) in learning for the achievement of the Sustainable Development Goals (SDGs) and is designed to contribute to the achievement of the SDGs. This manual provides topics and hands-on learning exercises for the SDGs, and in particular SDG Goal 12.

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CONTENT

INTRODUCTION

Currently, in the general education schools of the Kyrgyz Republic there is no special subject, in the study of which students would acquire the knowledge they need in modern life: about the culture of consumption and responsible (reasonable) consumer behaviour. This knowledge is in demand in a modern school and can be formed within the framework of classroom hours and extracurricular activities. Therefore, the proposed course "Responsible Consumption and the Environment" is of particular relevance and is intended to provide guidance for subject teachers, class teachers, and classroom leaders on the application of the principles of Education for Sustainable Development (ESD) in learning to achieve the Sustainable Development Goals (SDGs). This manual offers topics and teaching methods for SDGs, and in particular for SDG 12 (twelfth).

The logic of constructing the content of the course involves a combination of theoretical and practical lessons with the implementation of activating and pedagogical projective techniques with the main idea of the course. Practical exercises involve performing exercises and tasks of a creative nature, as well as conducting independent research by students - completing mini-projects.

The Responsible Consumption and Environment course works closely with science, mathematics and social education fields. The integrated nature of the course content implies the implementation of interdisciplinary connections with such subjects:

SUBJECT	TOPIC
Physics	energy-saving, energy consumption;
Maths	calculations related to ecological footprint, resource use;
Man and society	consumption, responsible consumption, green economy, linear and cyclical economy;
Geography	rational use of natural resources, climate change, conservation of biodiversity;
Informatics	information skills and media information literacy;
Biology, chemistry	greenhouse gases, climate change, etc.

Course objectives:

1. Formation of SDG competencies, including knowledge and practical skills of responsible consumption in various life situations.
2. Development of critical thinking, creativity and communication skills.
3. Fostering responsible (reasonable) consumption of natural, energy and other resources, as well as a culture of responsible behaviour.

Course goals:

- To study the interrelationships of social, economic and environmental development;
- To discuss production and consumption patterns, production and consumption relationships (CO_2 emissions, waste generation and disposal, health protection, etc.);
- To familiarize with strategies and practical approaches to existing principles of sustainable/responsible consumption;
- To teach to find the difference between needs and desires;
- To teach to critically assess their own behaviour as a consumer, taking into account the state of the environment, the needs of other people, cultures, countries and future generations;
- To provide insights into sustainable lifestyles so that students feel responsible for the environmental and social consequences of their behaviour.

SECTION I. TEACHING METHODS FOR SUSTAINABLE DEVELOPMENT

1.1. EDUCATION FOR SUSTAINABLE DEVELOPMENT AS A KEY TOOL IN ACHIEVING THE SDGs

In everyday life, we observe the consequences of anthropogenic activities leading to global environmental problems: migration, terrorism, conflicts, poverty, loss of biodiversity, soil degradation and climate change, etc. This means that the 21st century is largely characterized by deep interconnection of global problems. To meet these challenges, the United Nations (UN) has created many mechanisms – multilateral environmental agreements, global conventions and commitments, conferences, campaigns, programs such as the United Nations Environment Program (UNEP) and the United Nations, United Nations Development Program (UNDP), United Nations Days and Goals, Millennium Development Goals (MDGs) and United Nations Sustainable Development Goals 2030 (Fig. 1).

Why is it necessary to know the Sustainable Development Goals (SDGs) and the role of Education for Sustainable Development (ESD)?

Figure 1. 17 Sustainable Development Goals

Natural resources in the world are being depleted faster and faster, natural and man-made disasters occur constantly in different parts of the planet, economic and social crises accompany people every day. To address the challenges facing humanity, the UN has adopted the global program **"Transforming Our World: The 2030 Agenda for Sustainable Development"**, which aims to improve the well-being of the population and protect the entire planet.

The SDGs were adopted by 193 UN member states during a historic summit in September 2015. The new Agenda includes all three pillars of sustainable development - social, economic and environmental, as well as issues of peace and justice.

What is the role of Education for Sustainable Development in achieving the SDGs? ESD plays a critical role in the implementation of the global sustainable development goals. On November 28, 2017, the Second Committee of the 72nd session of the UN General Assembly, held in New York, adopted the resolution "Education for Sustainable Development in the Framework of the 2030 Agenda for Sustainable Development.

The resolution clearly recognizes that ESD is "integral" and "key to all other sustainable development goals" and calls on countries to scale up education for sustainable development through the implementation of the Global Program of Action on ESD.

The importance of studying the themes of the SDGs is explained by the fact that each person must contribute to the mitigation and solution of global environmental problems at the local level. This does not mean that only teacher and student can save the world. This testifies to the fact that all of humanity must unite in solving global problems. In this sense, education is the driving force behind global transformation. Humanity needs to learn to live together and make informed, responsible decisions based on the understanding that the actions we take here and now can affect the lives and activities of people in other parts of the world and future generations.

ESD focuses primarily on:

- training citizens to foresee problems/risks/challenges that threaten the development of civilization and Life on the planet, to resist them and find solutions;
- disseminating values and principles that are the basis of sustainable development;
- understanding the complexities and interdependence of three components: NATURE, SOCIETY AND ECONOMY.

ESD promotes the development of critical thinking and action for sustainable development, enabling children and adults to make decisions for a sustainable present and future.

A huge step forward in international coordination of action on ESD was made in May 2003 in the United Nations Economic Commission for Europe (UNECE) region. Ministers of the environment from 55 countries of Europe, North America and Central Asia at the 5th "Environment for Europe" Conference, which took place in Kiev, Ukraine on May 21-23, 2003, initiated and adopted the Declaration of the UNECE Environment Ministers on Education for sustainable development. Environment ministers have invited education ministers and other stakeholders to collaborate on this document under the auspices of the UNECE.

In 2005 in the Lithuanian capital Vilnius, less than two years after the Kiev Conference, the UNECE Ministers of Education and Environment adopted the UNECE Strategy on ESD at a joint high-level meeting.

The Strategy, adopted in March 2005 in Vilnius, defines ESD as "… education that develops and strengthens the capacity of individuals, groups, communities, organizations and countries to make choices for sustainable development".

The strategy is a flexible framework for implementing ESD and should be adapted by countries based on their needs and priorities.

The implementation of the UNECE Strategy for ESD was divided into stages:

Stage 1 (until 2007) - policies, legal and operational frameworks, funding mechanisms and activities in the field of education, national implementation plans as a framework and instrument for implementation, assessment methods and indicators of ESD implementation, in particular quality parameters. Ministerial Conference "Environment for Europe", Belgrade, Serbia (2007).

Stage 2 - (by 2010) countries should review the implementation of their national/state strategies and revise them as necessary.

Stage 3 - (by 2015) Countries should make significant progress in the implementation of Education for Sustainable Development.

Education for Sustainable Development is the integration of a wide range of educational strategies that address problems both locally and globally. ESD is about functional learning, collaborative dialogue and thinking, and is relevant to the development of key competencies. When forming, it is necessary to understand that competencies are not transferred. They should be developed by the teacher himself or a group of teachers and should answer the question: what specific competencies are needed and should develop in students?

UNESCO documents propose key ESD competencies that must be developed in learners to achieve sustainable development (Table 1).

Table 1

Key competencies in sustainable development

Key competencies	
System thinking competence	Ability to identify and comprehend interrelationships, to analyze complex systems, to understand the principles of interconnection between systems in different areas and at different levels, to act in conditions of uncertainty.
Predictive competence	Ability to understand and evaluate various options for the future (possible, probable and desirable), to form their own clear idea of the future, to apply the precautionary principle, to assess the possible consequences of actions, to take into account risks and ongoing changes.
Legal competence	Ability to understand and critically assess the norms and principles that led to the adoption of certain measures, to discuss the significance, principles, goals and objectives of sustainable development in conditions of conflict of interest and the need to reach a compromise, contradictions and uncertainty of available information.
Strategic vision competence	Ability to collectively design and implement innovative solutions to build resilience at local and higher levels.
Teamwork competence	Ability to learn from others, understand and respect the needs, point of view and actions of other people (empathy), understand, respond and show feelings for other people (empathic leadership), resolve conflicts arising in a group, participate in collective and multilateral interactions aimed at solving problems.
Critical thinking competence	Ability to question accepted norms, approaches and opinions, critically assess their own views, perceptions and actions, defend their position in discussions on sustainable development.
The competence of self-awareness	Ability to critically assess one's own role in the immediate environment and society as a whole, to be able to continuously evaluate and encourage someone's actions, to take into account the feelings and desires of others.
Complex problem solving competence	It is essential to use different problem-oriented approaches to tackle complex sustainability issues and to propose, based on the above competencies, viable, comprehensive and equitable solutions that promote sustainable development.

The competencies listed refer to the competencies that need to be developed in students for education for sustainable development, and **include:**

- their understanding of the scale and severity of environmental problems;
- the awareness that everyone should and can contribute to their decision;
- knowledge of ways to save resources and energy, preserve the climate, and ensure the quality of life without harming future generations;
- the demonstration and dissemination of energy and resource saving behaviour in society;
- a focus on promoting environmental knowledge and behaviour patterns in nature, production and in everyday life.

Responsible consumption and production is the **12th goal of sustainable development.** The creation of sustainable consumption and production patterns in conditions of limited resources in the modern world is one of the main requirements for sustainable development.

The goal is important because, globally, about a third of all food production, estimated at about US $ 1 trillion, is lost or wasted during production or consumption. These losses mainly occur during the production stages (harvesting, processing and distribution), while waste in the form of waste is usually noted during the retail and consumption stages. In industrialized regions, almost half of all food (about 300 million tonnes per year) is lost as waste due to the fact that producers, retailers and consumers refuse food that is still fit for consumption.

On the demand side, on current trends, the world's population will be approximately 9.5 billion by 2050, and the growing middle class worldwide will reach 3 billion by 2030. Current consumption patterns are the driving force behind unsustainable production and resource degradation.

Based on this, the formation of sustainable consumption patterns is very relevant, since it touches on such important issues as human values, equality, lifestyle choices and behaviours. Thus, **Sustainable Consumption** is the rational use of natural resources, or it can also be called "environmentally friendly" consumption.

Sustainable consumption *is consumption and production that is safe for the environment and human health. An important component of sustainable consumption is the entire production cycle that does not harm nature, from the extraction of raw materials to the disposal of waste. It is important what kind of packaging the product has, as well as its service life and the possibility of using it in a different form after the expiration date*

Source: Sustainable consumption every day. Environmental handbook projects.centralbaltic.eu › files › RINGSINWATER_result2_consumptionRUS

When studying sustainable development issues, it is important to pay attention to the concept of “responsible consumption”. **Responsible consumption** is a way of thinking and a corresponding lifestyle that involves the economical use of non-renewable or long-term renewable natural resources (water, timber, fuel - oil, gas, air, etc.).

Responsible *(reasonable, sustainable)* ***consumption*** *is a concept in the economy that implies the careful use of natural resources in the framework of satisfying only the necessary needs and a method for environmentally safe disposal of toxic waste and pollutants.*

To develop core competencies in responsible/sustainable consumption, the teacher needs to take into account the following:

- during class hours, extracurricular activities, extracurricular activities, environmental events, educational trips, meetings with specialists, as part of project and research work, etc. the active participation of all interested parties (parents, schoolchildren, teaching staff, local community) of the educational process must be ensured;
- in the classroom with students, it is necessary to offer them simple and practical solutions aimed at saving energy, water and other resources, for example: how to efficiently use an electric stove, car, water, heat, how to properly sort waste, etc.

Education in the field of responsible consumption (ERC) should use all the possibilities of modern teaching technologies, mass and multimedia in combination with the traditions, culture of the peoples of the Kyrgyz Republic and the experience of previous generations. Let us recall that an important area of the 12th goal of Sustainable Development “Responsible Consumption and Production” is the effective management of natural resources, a way to dispose of toxic waste and pollutants.

The importance of this area is based on the definition of the very concept of "Sustainable Development". Sustainable development is defined as such development that meets the needs of present generations, but does not jeopardize the ability of future generations to meet their own needs, and includes two key interrelated concepts:

1. the concept of needs, including priority ones (necessary to improve the quality of life of the poorest strata of the population);
2. the concept of limitations (due to the state of technology and the organization of society) imposed on the ability of the environment to meet the current and future needs of mankind.

For the formation of the key competencies of the SDGs/ERC, it is necessary to seriously change the approaches to organizing the traditional learning process. The fact is that the formation of key competencies should not be limited to lessons, class hours, extracurricular activities (which will be held at school), but should be considered as a continuous learning process.

It is important that the student learns to apply and supplement the knowledge and skills acquired in the classroom, in practice, in everyday life. To do this, it is necessary to teach schoolchildren to analyze actions from the standpoint of sustainability/responsibility, assess the consequences, and predict the situation. Only this approach will allow us to reorient our life in society in accordance with the requirements of sustainable development.

To achieve the set goals and objectives in the educational process, the teacher must take into account the full cycle of activities, including the following stages: goal setting, planning, organization, implementation of goals, analysis of results (Fig. 2).

As can be seen from Figure 2, the primary task of the teacher to achieve the expected results at the level of the lesson, extracurricular activities, circles, electives is to specify the goal. To plan these sessions, the teacher takes the following steps:

1. **Goal setting:** translating goals into measurable learning outcomes, determining the required level of achievement.
2. **Planning:** selection of content, definition of basic concepts, etc.
3. **Organization:** the choice of teaching methods and techniques.
4. **Realization of goals:** application of teaching methods and techniques, study of educational material, etc.
5. **Analysis and reflection:** assessment and definition of the achieved educational results.

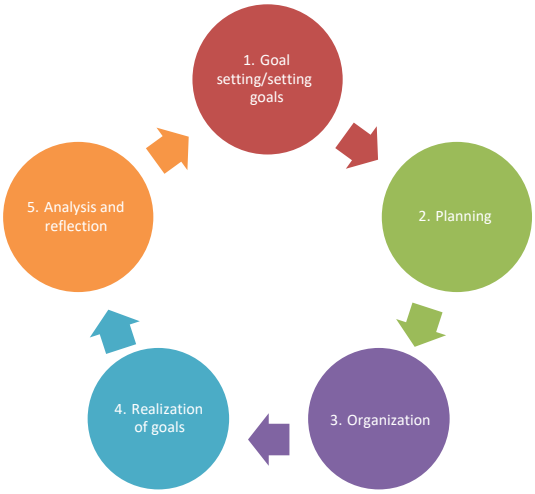


Figure 2. Full cycle of teacher's activity

A goal is a pre-planned end result achieved under the guidance of a teacher in teaching, upbringing and development of schoolchildren in the classroom.

Objectives are determined based on the study of the relevant topic and, in turn, have a great influence on the development of content, teaching methods and the entire course of the lesson. Once the goals have been defined, the lesson or lesson should be structured in such a way as to ensure that it is achieved. There are several basic requirements for the formulation of lesson goals:

1. the objectives of the lesson should answer the questions: "what knowledge will be learned by students?" – educational goal; "What skills will they develop?" – the practical purpose and development goal of students; "What is the contribution of the lesson to the education of students?" – educational goal;
2. the goals are formulated specifically, realistic, achievable, measurable, so that you can take into account how they are implemented in the lesson, i.e. they should record exactly which competencies will be formed in the lesson.

Selection of the content of classes.

The educational material is divided into semantic parts. In each part, the main, basic educational material is determined (leading concepts, basic facts, the most significant cause-and-effect relationships and dependencies, important patterns) and auxiliary. The teacher determines which educational material will be studied with his help, and which - by the students independently.

Selection of methods and means of teaching.

The choice of teaching methods and means depends on the goals and content of the lesson teaching material, the preparation of students, their age characteristics. In addition, the availability of training tools is taken into account.

The construction of a methodological model of classes is carried out by correlating each small fragment of the material with certain teaching methods. Various possible learning situations are predicted on the basis of a combination of content and teaching methods.

Assessment and determination of the achieved educational results.

Assessment of educational achievements of students is carried out at each stage of the lesson using various assessment techniques: "Two stars, one wish", mini-test, questions-answers, etc.

1.2. TRAINING GUIDELINES FOR EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

ESD requires a rethinking of traditional teaching methods, approaches and teaching in schools. These demands aim to build a more resilient global society and meet the challenges of sustainability, which in turn require the younger generation to have knowledge, skills, attitudes and behaviours. It encourages students to make responsible decisions and take action to preserve the environment. Its mission is to develop skills that enable people to critically assess their own activities, act rationally in difficult situations and responsibly participate in public life for the sustainable development of society.

The content of ESD provides for the study of such aspects as the preservation of terrestrial ecosystems, climate change, clean water and sanitation, quality education, good health, responsible consumption, etc. This implies the creation of an interactive and student-centred learning environment.

Thus, the hallmark of ESD is the shift from teaching to learning and the use of practice-transformative teaching methods that encourage students to work independently and individually in the classroom. Such pedagogical approaches can ensure the development of the key SDG competencies required to promote sustainable development.

Based on the above, it can be stated that ESD training sessions are directly related to the learning objectives of the SDGs. The learning objectives for achieving the SDGs are grouped by UNESCO as follows (Diagram 1):

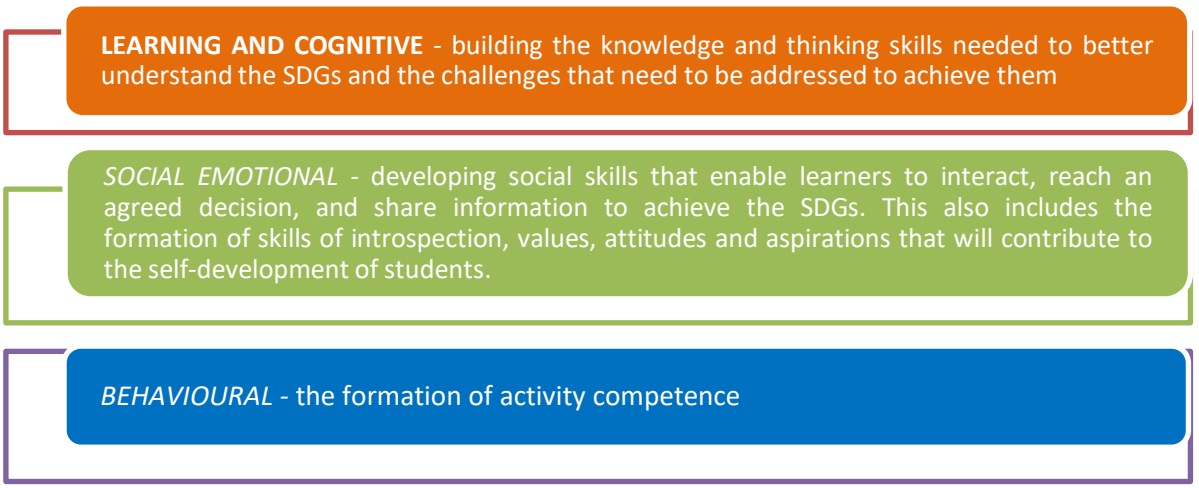


Diagram 1. Learning objectives for achieving the SDGs

When choosing topics for lessons, classroom hours and extracurricular activities, the teacher should be guided by the SDG themes proposed by UNESCO1 (Table 2).

1 Education for Sustainable Development Goals. UNESCO, 2017.

Table2.

Suggested topics for learning about the SDGs
• The concept of poverty, the extent and causes of manifestations of poverty and wealth at the global, national and local levels. • The role of the social protection system and measures. • The importance of equal rights to economic, natural resources, appropriate new technologies and financial services. • The relationship between poverty, natural disasters, climate change and socio-economic and environmental issues. • Working in poverty: extreme exploitation of workers, children and modern slavery. • Living standards of the poor and those in vulnerable situations. • Consequences of poverty: malnutrition, child and maternal mortality, crime and violence. • State and local programs to support the poor and gender mainstreaming.
• The concepts of "hunger", "malnutrition" and particularly vulnerable groups in terms of hunger and malnutrition. • Factors and causes of hunger, malnutrition, and the relationship between climate change, food security and soil depletion. • Implications of hunger and malnutrition on human health and well-being. • Migration as a way of people reacting to inadequate quality of life. • Problems of excess weight and food waste. • Global food production - imports, exports, trading systems, risks and challenges of the use of genetically modified organisms (GMOs). • Concepts and principles of sustainable agricultural development, climate-resilient farming methods, organic farming, biodynamic farming. • Biodiversity of seeds, plants and animals, especially with regard to wild species.
• Dangerous infectious and non-infectious diseases. • Problems of health of vulnerable groups of population and population living in the most vulnerable regions. • Understanding the impact of gender inequality on the health and well-being of the population. • Government policies and programs to promote health and well-being: vaccinations, healthy eating, physical activity, mental health, medical examination, education, sexual and reproductive health education, prevention of unwanted pregnancies and safe sex. • Education on sexual and reproductive health, family planning. • Discriminatory treatment of people infected with HIV and suffering from other diseases or mental disorders. • Traffic accidents. • Overweight and obesity, lack of physical activity and unhealthy food. • Chemicals and materials, contamination and pollution of air, water and soil.

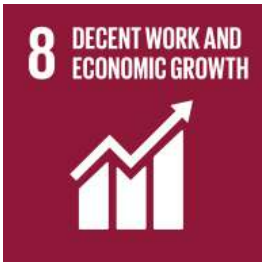
- The right of citizens to education is a necessary condition for the realization of all other rights.
- The Education 2030 Agenda, an analysis of specific success stories around the world.
- Quality education and lifelong learning opportunities for a person (formal, non-formal, informal education, use of ICT).
- Reasons for lack of access to education (poverty, conflicts, natural disasters, gender inequality, lack of government funding, etc.).
- Indicators of development in reading, writing, numeracy and basic knowledge.
- Diversity and inclusive education.
- Basic skills and competencies required in the 21st century.
- Knowledge, values, practical skills and principles of behaviour necessary to promote sustainable development.
- The concept of education for sustainable development (ESD), pedagogical methods of building competencies in the field of sustainable development.
- Rights and opportunities of youth and socially vulnerable groups.

- Gender equality as a sociocultural concept.
- Gender inequality, traditional male and female roles and structural discrimination.
- Gender equality and women's participation in decision-making.
- Gender and labour market: pay inequality.
- Gender and Education: Access to primary, secondary and tertiary education.
- Sexual and Reproductive Health and Rights.
- Gender and social relationships: decision making, childcare, education, conflict resolution, disaster risk reduction and climate change adaptation.
- Exploitation and trafficking of women and girls.
- Issues of national, racial inequality in society.

- Worldwide water distribution and access to safe and affordable drinking water.
- Sanitation and hygiene.
- Impact of pollution, waste and hazardous chemicals on water quality.
- The problem of lack of water.

- Energy types: renewable energy (solar, wind and water energy, geothermal energy, tidal energy).
- Production, supply, demand and use of electricity in different countries.
- Efficiency and energy supply of the population;
- Political, economic, social and environmental aspects of energy production.
- Energy security: dependence on non-renewable energy sources (oil, gas).
- Technologies for environmentally safe use of fossil fuels.

- The role of the economy in ensuring human well-being, the consequences of unemployment.
- Economic ethics.
- Indicators of economic growth (GDP, GNI HDI).
- Alternative economic models and indicators: steady state economy, welfare economy.
- Impact of investments, loans, inflation, etc. on economic development.



- Gender equality in the economy.
- Inequality in the labour market: differences in workers' earnings/wages between countries, sectors, social groups, genders.
- Formal and informal labour market, labour rights of migrants and refugees, forced labour, slavery and human trafficking.
- The role of entrepreneurship, innovation, new technologies in sustainable development.

- Waste disposal and recycling systems.
- Relevance of basic infrastructure development: roads, ICT, electricity and water supply.
- Sustainable electricity supply: state power system, feed-in tariffs, increased use of renewable energy sources.
- Sustainable labour market, sustainability of transport infrastructure, investment opportunities in local infrastructure.

- Discrimination and inequality indicators.
- Citizens' rights to land, property and natural resources.
- Taxation, wages and social protection policies.
- Representation of various social groups/citizens in government bodies.
- Population migration.

- Human need for housing, safety and participation in society.
- Rational use of natural resources.
- Sustainable energy: household electricity consumption, renewable energy sources, energy supply systems, transport.
- Sustainable food system: agriculture, organic farming, food processing, diet, waste generation.
- Ecology of cities, villages, adaptation of wild nature to existence in settlements, eco-villages, green cities.

- Construction of environmentally friendly and sustainable buildings: energy saving technologies, planning procedure.
- Generation and disposal of waste, recycling and reuse.
- Urban landscape planning, taking into account the water cycle in nature: greening roofs, collecting rainwater, cleaning old river beds, environmentally friendly drainage systems.
- Disaster Preparedness and Resilience.

- The impact of advertising, the influence of peers, the formation of a sense of belonging and one's own individuality.
- History of production and consumption, production and consumption patterns.
- Long term environmental and social impacts of production and consumption patterns.
- Production and consumption of energy in transport, manufacturing, agriculture.
- Food production and consumption: agriculture, food processing, diet and dietary habits, waste generation, deforestation, overconsumption of food, hunger problem.
- Waste generation and management (measures to prevent generation, reduction, recycling and reuse).
- Sustainable lifestyles and a variety of sustainable production and consumption methods.
- “Green” economy (waste-free production, circular economy, “green” growth, negative economic growth).

- Greenhouse gases and their emissions.
- Greenhouse gases associated with electricity generation, agricultural and industrial production.
- Risk factors associated with climate change: natural disasters, droughts, extreme weather events.
- Migration and population exodus due to climate change.
- Strategies for preventing and mitigating the effects of climate change and adaptation to them, their relationship with measures to respond to natural disasters and reduce their risk.
- Bodies and institutions dealing with climate change issues at the local, national and international levels. Local, national and global strategic climate protection programs.
- Possible future scenarios (including alternative explanations for global temperature increases).
- Long-term impacts and consequences of climate change on large ecosystems such as forests, oceans, glaciers, as well as on their biodiversity.
- Ethics and climate change.

- Hydrosphere: world and small water cycle, cloud formation, oceans and seas as an effective climate regulator.
- Rational use of marine resources: overfishing, aquaculture, algae, mineral resources.
- Sustainable marine energy.
- Marine ecology: organic world, food chain, coral reefs, coastal zone.
- Rising ocean water levels.
- Oceans and international law: international waters, territorial disputes.
- Ocean Pollutants: Plastics, Plastics, Wastewater, Chemicals.
- Use of oceans, marine resources.

- Ecology: species competition, predator-prey relationships, community relationships, energy transfer through the food chain, distribution and range. Ecosystem types: local and global natural and man-made ecosystems, such as plantation forestry.
- Threats to biodiversity: habitat loss and fragmentation, deforestation, invasive species and overexploitation (resulting from unsustainable production practices and unsafe technologies, etc.).
- Threatened: specific species under threat of extinction, how the complete extinction of the species occurs, the length of the formation period of the species, six examples of mass extinction.
- Measures to restore wildlife and the role of humans as a factor in healing.
- Climate change and biodiversity conservation, ecosystems as carbon sinks, disaster risk reduction and the role of ecosystems (ecosystems as natural defenses against natural disasters).
- Soil, its formation and structure.
- Desertification, deforestation and efforts to combat these phenomena.
- The relationship between man and nature as a natural state of affairs.
- Ecosystem services (cultural aspect, provision, regulation and maintenance of ecosystem services).
- Evolution and genetics, genetic resources, ethical aspects.

- Defining justice: punitive and rehabilitative justice.
- Crime and punishment, comparison of legislation and punishment systems in different countries of the world.
- Climate justice.
- Commercial justice.
- Child labour and child exploitation.
- Global compacts and agreements related to war, peace and refugees.
- Corruption and methods of its assessment.
- Illegal arm trades.
- Drug abuse and trafficking.
- International Criminal Court and its functions.

- Global partnerships between governments, the private sector and civil society for sustainable development: a shared responsibility.
- Systems, structures and dynamics of power relations at the local, national and global levels.
- Global governance and policy principles, the global marketplace and the global trading system in the context of sustainable development.
- Global citizenship and responsible world citizens as a driver of change for sustainable development.
- Cooperation in science, technology and innovation and exchange of knowledge.

When teaching the class, the teacher should keep in mind that ESD is aimed at increasing student motivation and developing critical thinking skills. Achieving goals and objectives presupposes the use of a personality-oriented, practice-transformative approach in teaching by the teacher and taking into account the following requirements for preparing for classes:

- *Planning the lesson taking into account the interrelationships of the SDG themes in each lesson*
- *Thorough preliminary diagnostics of the conditions under which the lesson will be conducted.*
- *Ensuring the interdependence and interdependence of all components of classes: goals, content, forms, methods and means of teaching, the activities of students and teachers, the expected result.*
- *Specific setting of the goals of the classes.*
- *The presence of a competence-based approach in the lesson: situations in which students master actual competencies, gain experience of an emotional-value attitude towards the world.*
- *Teacher's possession of educational material.*
- *Taking into account the laws and principles grounded in pedagogy.*
- *Ability to manage the class.*
- *Taking into account the experience of students.*
- *Individual and differentiated approach to students.*
- *Appropriate use of types of assessment: diagnostic, summative, formative (formative).*
- *Ownership of the teacher conducting feedback.*
- *Rational use of study time in planning and conducting classes.*

The effectiveness and efficiency of classes depends primarily on the methods, techniques and forms of the educational process. Various forms of interactive and traditional teaching are recommended. Below is a brief description of some of the methods, techniques and forms of training.

1. **Presentation.** Presentation (from Lat. praesento – presentation) – a document or set of documents intended to represent something (organization, project, product, etc.). A presentation can be a combination of text, links, computer animation, graphics, video, music, and soundtrack (but not necessarily all together), all organized into a single environment. In addition, the presentation has a plot, script and structure, organized for easy perception of information. A distinctive feature of a computer presentation is its interactivity *(source: Wikipedia)*.

Requirements for presentation design:

- By design:
  - the text and figures must be well read;
  - there should be no more than three colours;
  - slides should be in the same style;
  - should not be more, for example, 20 slides;

- by content:
  - the presentation should reflect the stated problem and have a narrowly focused character: touch on one problem, for example, saving heat;
  - the problem should be considered from different angles;

- the presentation should be not only illustrative;
- the presentation can illustrate the results of theoretical and applied research of students.

2. **Essays.** Students can be encouraged to write essays on responsible consumption not only by teachers of physics, biology, geography, but also by philologists. At the same time, if the topic is set "What can I do to reduce harmful emissions into the atmosphere in our country?", Students are offered the appropriate criteria, for example:

1) at least three solutions must be given;
2) each of the decisions must be reasoned/grounded;
3) the volume of the text should not exceed one page, etc. There may be other criteria that are related to the academic subject.

3. **Conducting promotions.** Students are encouraged to prepare and reproduce an appropriate flyer (a small handout) and then distribute it at home and among friends. The content of the flyer should be concise, attractive, convincing.

4. **Preparation of booklets.** Questions should be formulated that are meaningfully related to the place of residence. For answers, you can contact your local authorities.

5. **Developing rules** for the economical use of water, heat and electricity. This work can be performed by groups of students: ecologists, physicists, biologists, philologists, heat engineers, plumbers, etc. Each group formulates rules from the standpoint of their specialty.

6. **Writing a play about climate conservation.** The characters in the play can be members of the same family, in which the residents of the apartment are committed to different values in relation to the conservation of electricity, heat, disposal of paper and plastic waste, etc.

7. **Carrying out the action. For example, on the topic "A day without a car."**

1. Ask the motorists you know to answer the question: “Why did they leave/didn’t leave the city in their car today?”.
2. Summarize the results of the survey, draw conclusions and publish in the local newspaper.
3. Prepare a flyer about the importance of drivers' participation in the action and distribute it to owners of personal vehicles.
4. Calculate the number of cars that drove past the school from 7.30 am to 9.00 am and draw conclusions about the effectiveness of the work.

8. **Entering into the table of the main actions for energy saving.**

1. Turn off lights when not needed.
2. Unplug electrical appliances in a timely manner.
3. Do not allow multiple electrical appliances to operate unless necessary (TV, computer, tape recorder).
4. Unplug electrical appliances operating in standby mode at night.
5. Use energy saving bulbs instead of incandescent bulbs.
6. Wipe off dust from the bulb. This will allow her to shine brighter, and no additional lighting is required.

7. Do not open the refrigerator door unnecessarily.
8. Use the washing machine at a full load.
9. Defrost the refrigerator in time, as energy is spent not on cooling food, but on the formation of ice.
10. Be neat, take good care of your clothes. A lot of energy is spent on washing and ironing.
11. To prepare porridge, pre-soak the cereal in water (for 8-10 hours).
12. Turn off the hotplate on the electric stove before the food is ready or the water boils, as this will save up to 20% of energy due to the thermal inertia of the hot hotplate.
13. Place the refrigerator away from heat sources: radiators, stoves. Do not place it in a niche.
14. After each cleaning, clean the dust container with a vacuum cleaner.
15. Turn off the standby mode of household electrical appliances.

Appliance name	How you can reduce your electricity use
TV	
Washing machine	
Refrigerator	
Electric lamp	
Vacuum cleaner	
Microwave	
Iron	
Heater	

9. **Fill in the table**

№	Energy sources	Advantages	Disadvantages	Development prospects

10. **Study of the global problems of mankind.** The task may look like this: “Select 6 global problems of humanity, write them on the cards. Distribute the sub-problems below on the matching cards".

- Destruction of the ozone layer
- Deforestation
- Demographic problem
- The problem of health protection (cancer, AIDS, SARS, COVID-19, etc.)
- Greenhouse effect (global warming)
- Food problem
- Poles of development: "North-South"
- Destruction of resources
- Degradation of "mass culture", devaluation of moral and ethical values
- The problem of the level of education (1 billion illiterates). Global problems of humanity
- Ethnic, confessional conflicts
- The problem of war and peace: the possibility of growing local conflicts into global ones, the danger of a nuclear war
- People's departure from reality to the world of illusions (drug addiction)
- The growth of aggression, neuropsychic diseases due to massive computerization
- Pollution of the environment: atmosphere, waters of the World Ocean
- Natural disasters: typhoons, tsunamis, hurricanes, earthquakes, floods, droughts
- The problem of the boundaries of economic growth
- Differences in political systems (democracy, authoritarianism, totalitarianism).
- Terrorism

11. **Draw up a chronology of events.** For example, arrange in chronological order the sources of energy that became available to humanity, starting from the earliest:

- atomic energy;
- muscular energy of working animals;
- oil;
- wind energy;
- human muscle strength;
- gas;
- coal;
- the energy of waterfalls, rivers and streams;
- energy of sun.

12. **Prepare texts on the problem of energy saving:**

- memo (formal business style);
- text-appeal to the newspaper (journalistic style);
- information for the site (scientific style);
- essay (art style).

Groups use pre-prepared materials, working time - 10 minutes, 4 minutes to defend work.

13. **Working with the table. An example of such a task might look like this:**

1) Fill in the table "Climate change"

Causes of global warming	Consequences of global warming	Energy solutions to improve the situation

2) Fill in the table "Global problems of mankind".

Environmental	Economic	Social	Political	Spiritual

14. **Rationale for the choice. For example, “What is your position on global warming? Justify your choice".**

Sample options:

Global warming is a consequence of the barbaric attitude of people to nature, to the available resources, it is a payment for comfort, for the conveniences of life that residents of many countries have.

It is necessary to drastically reduce energy consumption, stop deforestation, and recycle waste and garbage. This is the only way to ensure sustainable development not to the detriment of future generations.

The greenhouse effect is, of course, one of the causes of climate change, but only one of many.

Neither the behaviour of the Sun, nor the volcanic activity, nor atmospheric circulation in any way depend on man. And no matter what we did, climate change would still occur. We must not confront him, but adapt, take adaptive measures.

15. **Game "Carpet of Ideas".** Formulation of the problem. On a sheet of Whatman paper, the title of the problem "The emergence of the greenhouse effect: causes, consequences, prevention measures" is written in large letters. Awareness of the problem (why does such a problem exist?).

On strips of green paper, each member of the group writes down the cause of the problem and sticks their strip on Whatman paper. *One streak - one reason*. Geographic forecast (what the problem can lead to if you do not start solving it).

On a red strip, *students write down the forecast* (what will change in the future) and glue their strips onto a Whatman paper. Putting forward ideas (what can be done to change the existing situation, including on the territory of Kyrgyzstan).

On a strip of blue**,** students write down their ideas for solving this problem (one strip – one idea) and stick it on a Whatman paper. Putting forward your own "I" (which I PERSONALLY will do to improve the current environmental situation).

On a yellow strip, *each member of the group writes down their action and sticks it on a Whatman paper.*

After that, the finished Carpets of Ideas are posted on the blackboard. Groups present their developments to the class. After the performance of each group, the teacher complements (as necessary) the "Carpet of Ideas" presented by the students

Teacher additions can be as follows:

The reasons. An increase in greenhouse gas concentrations due to an increase in the car park, the rapid growth of energy and other types of industry, which collectively emit harmful gases into the atmosphere.

Geographical forecast: Earth's climate change - warming, the nature of precipitation is changing, extreme events (floods, droughts), acid rain are becoming common. Climate change has resulted in greater instability of the weather and an increase in unfavourable climatic phenomena - frosts, floods, droughts, snowless winters, strong winds, fires in forests and peatbogs, river floods.

16. **Putting ideas forward.** Putting forward your own "I". Students can come up with the following ideas:

- I will plant a tree (trees), I live and will live under the slogan “Green! Improve! Take action!" ,
- I collect and will collect waste paper, I will move around my small village/city by bicycle (I will keep clean air and good for my health),
- I will sort waste and hand over for recycling: glass, plastic, metal, batteries, etc.,
- I will propose to the city administration to create bicycle parking lots to reduce the flow of cars in the city, etc.

17. **Quiz.** Quizzes can be conducted as a generalization of the questions studied. Below we offer as an example.

1. **A quiz in the format of a television game** “What? Where? When?". Students may be asked the following questions:
   1) We do not notice it, it is invisible to the eye. We just breathe it in - we need it! (Air.)
   2) What plants are most conducive to air purification in the city? (Poplars and elms).
   3) What plants contribute to indoor air purification? (Chlorophytums and Pelargoniums).
   4) Why “black gold” can bring great trouble to humanity and the planet? (Oil in water is a global disaster, this disaster affects the entire ecosystem as a whole).
   5) Why, even knowing about the dangers of nitrates and nitrites, people use them in the production of agricultural products and in the food industry? *(Nitrite supplements are a way of colouring, preserving, improving the taste of meat products. The main purpose of such supplements is to kill the causative agent of botulism, which produces a toxin that is fatal to humans even in negligible doses).*
2. **Quiz** (sample questions):
   1) *In which European country more than 20% of energy per year is generated by wind turbines - Germany or Denmark?*
   2) *Climate change in Kyrgyzstan is more noticeable in summer or winter?*
   3) *In which city is it more efficient to use the energy of the Sun - Oslo or Cairo?*
   4) *What dwelling the Eskimos will not build without snow - a yurt or an igloo?*
   5) *Where was the world's first tidal power plant built - in France or in Russia? (In France on the Rana River in 1966).*
   6) *Which country will be most affected if the sea level rises by more than 50 centimetres - Switzerland or the Netherlands?*
   7) *Who will be more affected in the Arctic due to climate change - penguins or polar bears? (Penguins live in Antarctica).*
   8) *Is methane a greenhouse gas? (Yes).*
   9) *In which country was the Kyoto Protocol adopted - the USA or Japan?*

18. **Games. Game "Environmental Problems and Energy Saving: The Duel of erudites".** *Game rules.* Two teams of 5-6 people take part in the game. The game is played in 4 rounds.

I Round: "Energy Saving";
II Round: "Contemporary Environmental Problems";
III round: "Solve the problem";
IV round: creative competition.

In the first two rounds, the captains take turns choosing a topic and a question. The presenter reads the question. You have 10-15 seconds to think it over. If the answer is correct, the team receives points in accordance with the cost of the question, if the answer is incorrect, the same number of points is deducted. If the team that chose the question did not answer, then the opposing team answers.

In the third round, by the decision of the team, the captain can answer the question, then the points for the correct answer are doubled.

Time to solve the problem is 30 seconds. All points earned by teams are taken into account. Each round ends after all questions are answered. Between rounds, a game is played with spectators.

After the completion of the fourth round, the results are summed up.

19. **Competitions.** The competition can cover various topics related to sustainable development. Here we offer a competition in the form of "**Proverbs**" on the topic "Thrift". The task is called "Who is faster?" Pupils are given a sheet of notebook or paper divided into two parts. The task of the students is to connect them in meaning. For each correct connection 1 point is awarded.

The beginning of the proverb	The end of the proverb
Thrift	but for the winter
A drop is small	is more valuable than wealth
A thrifty thing	more than your own
The penny saves a ruble	but a drop by drop - the sea
Take care of someone else's	lives for two centuries
It's better to save your own	during the day
We won't go to the forest	than live someone else's
The hut is not cut for the summer	then we will freeze on the fields
No need for a lantern	and the ruble guards the head

Right answers:

- *Thrift is more valuable than wealth.*
- *A thrifty thing lives for two centuries.*
- *The penny protects the ruble, and the ruble guards the head.*
- *Take care of someone else's more than your own.*
- *It's better to keep your own than to live someone else's.*
- *We will not go to the forest, then we will freeze on the fields.*
- *The hut is not cut for the summer, but for the winter.*
- *No need for a lantern during the day.*
- *A drop is small, but a drop by drop is a sea*

20. Warm up. When conducting classes, it is considered expedient to conduct warm-ups of a various nature related to environmental protection. For example, on the topic “When I wash my face and brush my teeth”. The teacher will read the statement, and if you agree with him, then clap your hands 2 times, if not, stomp 2 times.

1) I only think about my problems.
2) I will spend as much water as I like.
3) It is stupid to save water, because parents pay for it.
4) The problem of water is a problem for adults, let them solve it.
5) I don't pollute the water at all, I have nothing to do with it.
6) I admire water - it's an amazing substance!
7) Water makes me feel good.
8) I turn off the tap for a while I brush my teeth.
9) I tightly turn on the taps, and when water continues to drip from them, I call adults and ask them to fix the tap.
10) There is a lot of water on Earth, you don't have to worry, there will always be enough clean water.

21. Questions for a blitz game *(sample)*

1) Variant 1.

1. The accumulation of carbon dioxide in the atmosphere is one of the main causes of the greenhouse effect. (Yes - no.)
2. The fuel and energy industry is the most polluting industry. (Yes - no.)
3. A car is a chemical factory on wheels. (Yes - no.)
4. In Sweden, in 1990, a tax on the production of carbon dioxide was introduced. (Yes - no.)
5. An increase in the concentration of greenhouse gases in the atmosphere will lead to an increase in temperature by 10 ° C by 2025. (Yes - no.)
6. The bright white light of glaciers and snow covers reflects sunlight back into space, cooling the planet. (Yes - no.)
7. Now the average US resident burns so much fuel annually that 19 tons of carbon dioxide are released. (Yes - no.)
8. Reusing materials such as glass and plastic bottles, plastic bags does not save resources, fuel and raw materials. (Yes - no.)
9. The world fleet of cars with internal combustion engines (internal combustion engine) annually emits 260 million tons of carbon monoxide, 20 million tons of nitrogen oxides, 40 million tons of volatile hydrocarbons. (Yes - no.)
10. Each person can help in solving the problem under consideration. (Yes - no.)

2) Variant 2.

1. Climate is the state of the atmosphere in a given place at a particular moment in time (No).
2. Weather is the state of the atmosphere in a given place at a particular moment in time (Yes).
3. Climate is a geographic characteristic of an area, long-term weather regime (Yes).
4. The climate of the area primarily determines the latitude of the place (Yes)

22.Conferences. The conference is held to discuss problematic issues. For example, in a press conference on Climate Change, students play the roles of high-level officials, academics, business leaders, climatologists, ecologists, representatives of the state environmental protection agency, mining enterprise, ministries of agriculture and health.

***Possible questions**:*

- What are the causes of climate change?
- Both optimistic and pessimistic forecasts regarding the planet's climate change are expressed in print, on the Internet. What is your opinion and what is it based on?
- What activities does your organization/enterprise take to reduce the harmful impact on the environment?
- How will global warming affect the climate of our country?
- What changes will happen in agriculture? How will this affect people's health?
- What are the reasons for the pollution of Lake Issyk-Kul and what is necessary to preserve the pristine purity?

Another option for the conference could be an **online meeting** on energy issues, responsible consumption, climate change, etc. Participants include ecologists, power engineers, seismologists, climatologists, representatives of agriculture and forestry, historians, and journalists. Modern communication tools (Skype, WhatsApp, Zoom, Microsoft Teams, Google Classroom, etc.) allow organizing online meetings between schools.

1.3. CHARACTERISTICS OF PEDAGOGICAL TECHNOLOGIES AND INTERACTIVE METHODS

At present, the end result of training is not so much the amount of acquired theoretical knowledge as the **ability** to apply it in practice, use it for self-development and self-education. This means that pedagogical technologies used in the educational process must guarantee the planned results. Here the question may arise: what is pedagogical technology?

The modern explanatory dictionary on technology says: "... 1. The totality of production operations, methods and processes in a particular branch of production, techniques used in any business, craftsmanship, etc. ... 2. A body of knowledge about the methods of processing materials, products, methods of implementing any production processes (Big Explanatory Dictionary of the Russian Language, 2000, p. 1332).

The concept of "technology" in the educational process indicates its origin from the Greek words "techne" - art, skill and "logos" - teaching. Therefore, the term "pedagogical technology" can denote not the production process, but pedagogical skill, the art of teaching. As defined by UNESCO: "Pedagogical technology is a systematic method of creating, applying and defining the entire process of teaching and assimilation of knowledge, taking into account technical and human resources and their interactions, which aims to optimize the forms of education." Thus, pedagogical technology is methods, forms, means, methods, material resources, etc., interconnected into a whole, ensuring the achievement of the goal.

Teaching methods are a set of techniques and approaches that reflect the form of interaction between students and teachers in the learning process. In the modern sense, the learning process is considered as a process of interaction between a teacher and students (lesson) in order to form the competencies of students. When developing the competencies of students, it is considered appropriate to use active teaching methods. An active teaching method is a form of interaction between students and teachers, in which the teacher and students interact with each other during the lesson, and the students are not passive listeners, but active participants in the lesson. Therefore, from the point of view of modern pedagogical technologies and the effectiveness of the assimilation of educational material by students, the passive method is considered the most ineffective. The passive method in some cases works successfully for an experienced teacher, especially if students have clear goals aimed at a thorough study of the subject. Lecture is the most common type of passive lesson. This type of lesson is widespread in universities where adults, fully formed people, motivated to deeply study the subject, study.

Interactive methods can be considered as the most modern form of active methods. The word "interactive" comes from the English language ("inter" is mutual, "act" - to act), means "to interact", to be in the mode of conversation, dialogue with someone. In other words, unlike active methods, interactive ones are focused on broader interaction of students not only with the teacher, but also with each other in the learning process (Figure 3). The place of the teacher in interactive lessons is reduced to the organization and direction of students' activities to achieve the goals of the lesson. Pupils actively explore the material through interactive exercises and assignments. Interactive learning develops critical thinking, independence, and facilitates situation analysis.

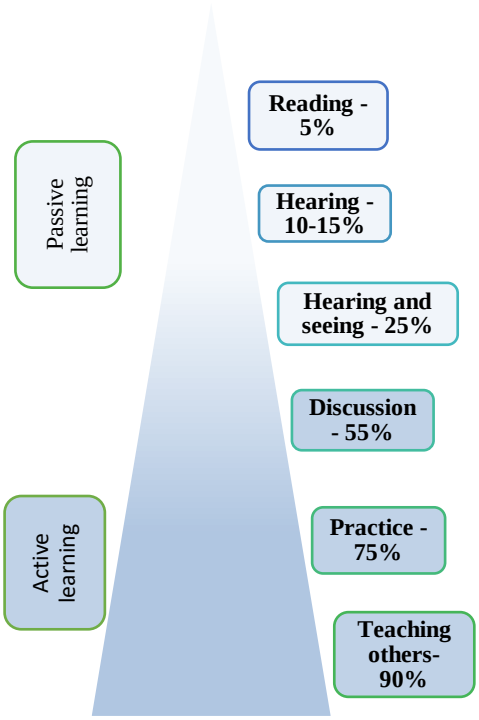


Figure 3. The learning process efficiency pyramid

As shown in Figure 3, the greater the degree of student participation in the learning process, the more effectively the information is assimilated. Thus, the task of modern education is to move to active and interactive teaching methods. Using interactive teaching methods, you need to puzzle students and pose problems to them without giving ready-made answers. Here the teacher's activity gives way to the students' activity and conditions are created for their initiative. Currently, many forms and methods of interactive learning have been developed. Let us briefly designate one of them, which has confirmed the greatest efficiency - the technology "Development of critical thinking through reading and writing."

The technology "Development of critical thinking through reading and writing" is aimed at developing students' reading competence; development of written language; fostering teamwork; to develop the skills of using graphic organizers, which are implemented using the methods and techniques described in Table 3

Table 3.

Functions, methods and techniques of technology "Developing critical thinking through reading and writing"

Functions of methods and techniques	Methods and techniques
Formation of students' reading competence	INSERT, two-part diary, guided reading, literary circle, I know, I want to know, I found out, questions to the author.
Development of writing and speaking	Analytical generalization, analytical essay, cinquain, diamond, cube. Methods of working with the text (the method of sequential questions, the definition of keywords, concepts in the text, composing questions to the text of the textbook through the main words, drawing up plans and an additional scheme).
Building a team spirit	Zigzag, concept map, reading and summing in pairs, POPS method (think, discuss, share, compare), round table, brainstorming, ranking of opinions, responses, debate or aquarium.
Developing skills in using graphic organizers	T-diagram, cluster, Venn diagram, concept map.

Below is a description of some of the techniques of "Critical thinking through reading and writing".

Listing - can be used as a brainstorming technique or as a technique for collecting

variations of descriptions or definitions for a concept. This requires students to name words that would define or describe something. Once students have completed this activity, you can use these lists to facilitate group or open discussion. For example: Ask students to name 5-7 words or phrases that describe or define what a motivated student is doing. Here you can also ask students to form pairs or small groups to discuss lists or to select one of the answer options that everyone agrees with.

Two-part diary - can be used by students to take notes on articles and other resources they read in preparation for class discussion. Students read, reflect on the material given for reading and prepare a two-part diary, marking important points from the read, writing down any answers on the material read, both in general terms and on a specific topic. Students bring their journal with notes to the class to start discussions, make paired annotations, etc.

Paired annotations: Students form pairs to review or study a single article, chapter, or table of contents, and exchange two-part diaries for reading or reflection. They discuss key points and look for common and similar opinions and ideas, and then together prepare a combined abstract that summarizes the article, chapter or concept.

Output card. Ask each student to comment on the following questions: What did you find the most important and useful of what you learned today? which two questions remain unclear to you and which you would like to ask? what would you like to know more about?

Give them one minute each and time them. This work will help them focus on the content and can also provide feedback to you as a teacher. You can use these one-minute activities to kick-start the next day's discussion, to boost group discussion, or to get feedback on how the student understands and learns the given material.

Submit Problem - Used for group discussion and review of material or possible solutions to a problem related to topic information.

1. Each member of the group finds the problem and writes it down on a card. Then they ask each other questions.
2. If the question is answered and all members of the group agree with it, then the answer is written on the back of the card. If there is no agreement on the answer, then the question is revised so that the answer can be agreed upon.
3. The group marks the side of the card where the question is written with the letter “B”, and marks the side where the answer is written with the letter “O”.
4. Each group sends a question card to another group.
5. Each group member takes one question from the stack of questions and reads it to the group. After reading the first question, the group begins to discuss it. If the group agrees on an answer, they turn the card over to compare the answers and say whether they agree or not. If they do not agree with the answer of the first group, then they write their answer there as an alternative one.
6. The second group reviews and answers each question in the stack of cards, repeating the procedure above.
7. Question cards can be given to the third, fourth or fifth group, if desired.
8. The stack of cards is then transferred back to the first group. The sending team can then discuss and clarify any issue.

Variations. As a variation on this exercise, you can use the exact same process to discuss a real problem with groups that may not have a single answer.

1. Groups decide which problem to choose for consideration. It is better when each group considers its own problem.
2. Here, groups can also use brainstorming to find one solution to a problem. The problem is recorded and attached to the outside of the envelope. And the list of decisions is enclosed in an envelope.
3. The envelope is then transferred to the next group. Each group brainstorms the problem for 3-5 minutes without reading the work of the previous group, and then put their answer sheet in the envelope.
4. This process can continue in one or more groups. The latter group reviews all the solutions proposed by the previous groups and develops a priority list with possible answers. The list is then presented to the group.

Peer-to-Peer guided Interviewing. The purpose of this work is to develop discussion skills.

1. The teacher gives a short lecture (for 10-15 minutes) on any issue, and can also ask reading material or writing.
2. Students, working individually, write down their questions about the material.
3. Students do not have to answer self-asked questions. This activity is designed to make students think about things that are relevant to the topic under discussion.
4. Students should use as many questions as possible.
5. Grouped into learning teams, each student proposes a question for discussion.

Sample questions: what is the main idea ……?, What if… ..?, How… influences… ..?, What is a new example… ..? Explain why….?, Explain how… ..?, Which does this have to do with what I have studied before ?, what conclusion can I draw about… ..?, what is the difference between… .. and ……?, what are the similarities… ..with ……?, how can I use… .. to… ..? what are the strengths and weaknesses ……? which is the best… .. and why?

Brainstorming – is a specific set of procedures designed for a group of people to generate ideas and solve problems. Brainstorming in the classroom is a great way to solve problems, generate ideas, make lists, and identify possible questions and answers. At the first stage, before the start of the lesson, you need to discuss the issue that will be submitted for consideration. At the second stage, the students are asked a question or problem that needs to be solved. The question should be clear.

A concept map – is a way to represent and connect thoughts. The basic rules were developed in the 60s by Professor Joseph D. Novak of Cornell University, who, in turn, proceeded from the theory of David Ausubel, who showed the importance of previous experience for the formation of new concepts.

The proposed method serves as an alternative to using the standard scheme for taking notes of new knowledge and information. Creating maps allows you to:

- structure ideas in a hierarchical order through the use of main, secondary, tertiary (etc.) branches,
- reinforce ideas with clear and colourful images, show connections between them,
- highlight concepts with colour, font size, highlighting, etc.,
- rate and comment on ideas using special symbols.

Concept involves writing down the main idea and thinking through new, associated ideas that are associated with the main idea. By focusing on key ideas the map helps

students understand and remember new information. Concept map steps:

Step 1. Write the main idea to the centre. Many students find it more helpful when they work on an unfolded piece of notebook to draw a landscape-style mind map. In this case, the main idea or topic is in the centre of the page, and this provides maximum space for writing other thoughts around the central idea.

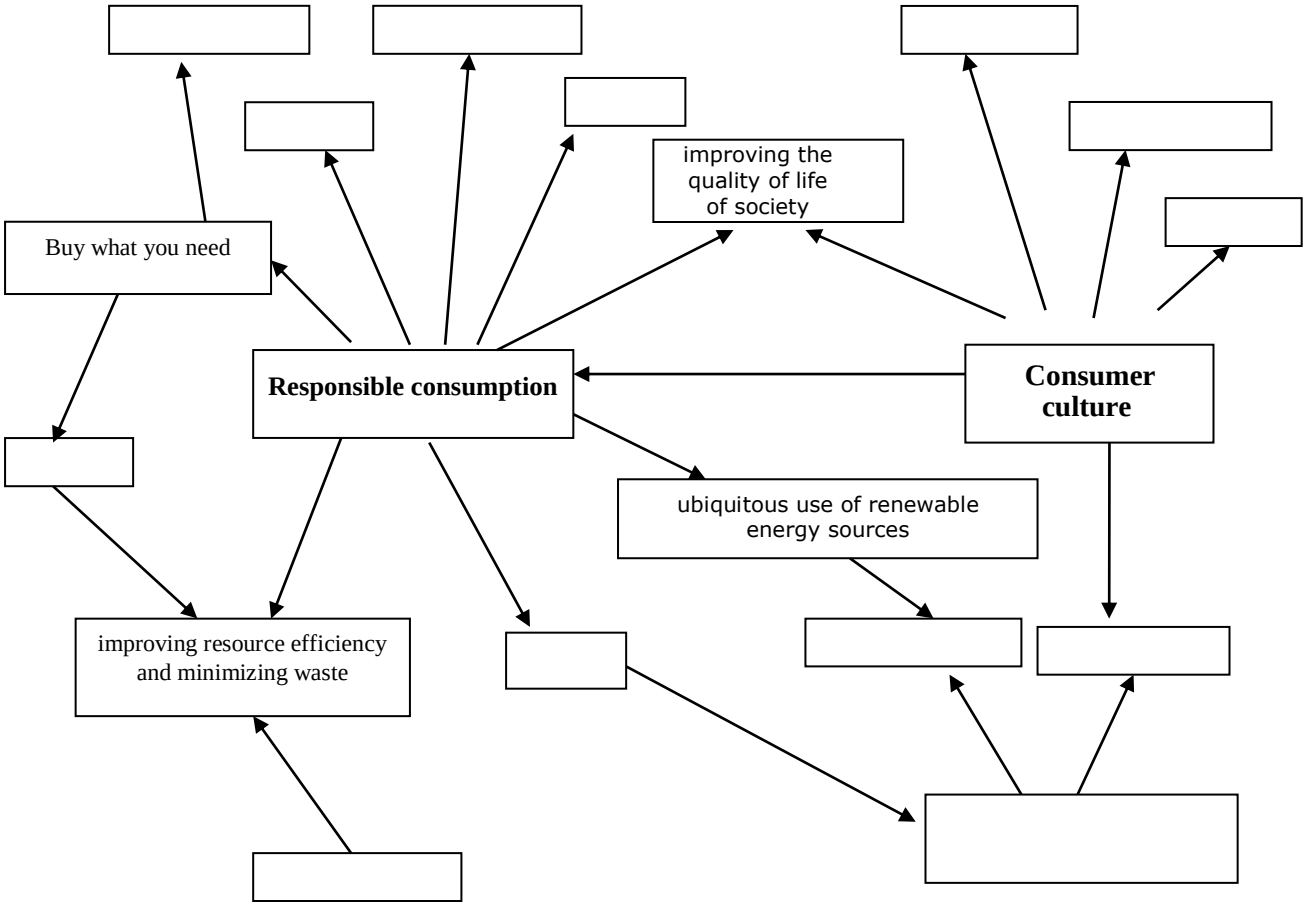
Step 2. Draw on paper, without pauses, judgments or editing. Edit the information later, but at this stage it is important to put each possibility on the mind map.

Step 3. Look for connections. Use lines, colours, arrows, branches, or any other sign to show the connection between thoughts that appear on the mind map. These connections are important for understanding new information, building a structured essay plan. By shaping your map with symbols and pictures, you can build visual and meaningful connections between thoughts that help you remember and understand.

Step 4. Use capital letters. The idea behind using capital letters is to only write down the key points. Words written in capital letters are also easy to read in charts. Explanatory notes should be written in small letters.

Step 5. Leave more space on the records. The most useful mind maps are those that are updated with information over time. After the first sketch of the mind map is done, you can add information or questions throughout the entire study period. Therefore, it is recommended to leave more space.

Example:



As you can see from the figure, the view map consists of cells that contain a concept, item or question. Each of the cells is linked to the other with an arrow. The arrow describes the direction of the relationship and reads like a sentence.

Alternatively, you can start with the main topic, set the most important general ideas related to it, and arrange them as branches around it, and then develop these topics in sub-branches (branches 2, 3, etc. of orders) on which you place your ideas or keywords.

Categorical overview. *This strategy allows students to organize the ideas that emerged during the brainstorming session and creates a foundation for deep understanding.*

Category - a group of objects, phenomena, facts, united by the commonality of any signs, and develops:

The range of target orientations on personality structures:

- informational – knowledge, abilities, skills;
- operating – modes of mental action.

Execution steps:

Step 1. In the group, brainstorm and write down all the ideas on the topic.
Step 2. Find more general ideas/categories that can combine the information received on the basis of any signs.
Step 3. List the categories on a piece of paper or chalkboard. Distribute ideas, information obtained as a result of brainstorming in the appropriate categories.
Step 4. During assignment, students can change the name of a category. New categories may appear.
Step 5. Consider a way for the groups to share or view other work.

TEACHER RECOMMENDATIONS

1. There is no single, correct way to categorize information.
2. The categorization in one group will be different from the categorization in the other.
3. Do not compare or highlight any work. First, it creates group egoism. Secondly, the students are not silly, they will be able to assess themselves.
4. Don't give pre-prepared categories.
5. Creating categorical reviews is important as a process, not an end product.
6. This method is good to use both at the beginning of the lesson and at the end.

A cluster is a way to map information, ideas and questions. Clustering is based on cognitive research and will help you find and generate ideas, structure or de-structure them before arranging them in any order. This technique is used to collect thoughts around a factor, to use someone else's experience and shape.

The clustering method is a pedagogical method that develops the variability of thinking, the ability to establish connections and relationships of the studied concept (phenomenon, event), helps students think freely and openly about any topic. Clustering requires only those structures that provide an opportunity to stimulate thinking about the connections between ideas. It is a non-linear form of thinking and is closely related to how our brains work. The word "cluster" means a bundle, a bundle. Breaking down into clusters evokes fresh associations, gives access to existing knowledge, and involves new ideas on a specific topic in the thought process. It is most appropriate to use clustering before a particular topic is explored more thoroughly. Clustering is used as a stimulus for thinking.

The group composing cluster serves as the core for the group's ideas.

Sequence of cluster compilation:

1. In the centre of a chalkboard or large piece of paper, write a keyword or sentence.
2. Write down words or sentences that you think are related to the topic.
3. Establish appropriate connections between concepts and ideas.
4. Write down as many variations of ideas as you can until time runs out or until all your ideas are exhausted. The basic rules for creating clusters are similar to those for brainstorming.

TDSC method (think, discuss, share, compare). The method helps participants to exchange information, take into account all points of view, collect all ideas in a group. The method includes 4 stages: 1. Thinking and writing down all ideas on the chosen topic (or all answers to the question asked); 2. Exchange of ideas in pairs and addition of personal lists; 3. Exchange of views in groups of 4 - 6 people; 4. The final stage is collecting all ideas, opinions, thoughts and comparing the answers. Brief presentation of ideas by each group. When performing an exercise or assignment, the following rules must be observed: strict adherence to the time frame, the ideas expressed should not be repeated, all ideas are entered into a general list without discussion and evaluation.

Ranking of opinions, answers. The method helps to realize your mistakes, find the right answers, and activate the process of cognition. It includes the following stages: students are divided into groups of 4-5 people, the group receives a set of statements or answers on a specific topic; and it is proposed to arrange the statements into columns depending on the degree of agreement - yes agree; yes, but there is a clarification; acquaintance with the results of work in groups, analysis of tables, comparison of their estimates with the correct ones; making corrections to the table.

Debate or "aquarium". This technique provides an opportunity to see their peers from the outside, evaluate how they communicate, how they react to someone else's thought, how they settle an impending conflict, how they select arguments to confirm their point of view. This technique includes: selection in a small group of a person who can be trusted to lead a discussion on a given topic (problem); the rest of the group members act as spectators; defining the rules for conducting debates; evaluation by "spectators" of the results of the debates.

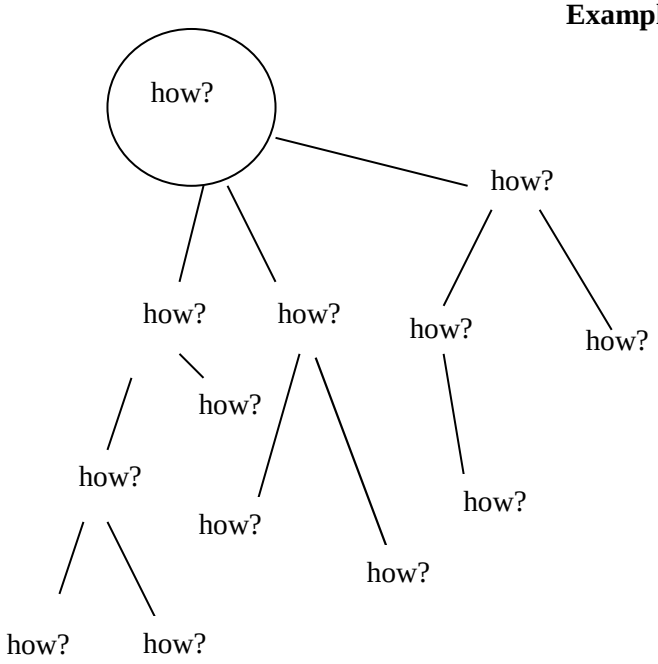
1.4. GRAPHIC ORGANIZERS AS TOOLS FOR OUTLASS CLASS PLANNING

In this subsection, you will learn about various graphic organizer techniques to help you find solutions for your various extracurricular activities. Having adapted the presented techniques, you can use them in the educational process, which is an additional methodological resource. Some of them are especially useful in situations where you need to formulate a problem more clearly or find its causes. Others allow you to determine the structure of the problem – this way is closer to people inclined to an analytical type of thinking. Nevertheless, in all these techniques there is another - the creative principle. Stimulating creative thinking with visual (visual) images is considered the most relevant. Problem solving in the face of disabilities and the associated planning of activities is one of the difficult tasks, since it is necessary to define all the large and small tasks into which planning is broken down.

DIAGRAM "HOW?"

"HOW?" – this is the main question that you ask when solving a problem. In most cases, you don't need to think about what to do. The problem almost always lies in the answer to the question: "How to do it?" When using the "HOW?" to the answer to one question "How?" there must be another such question. Thanks to this, in the process of work, you explore not only the possibilities. but also the ways to implement them.

Example

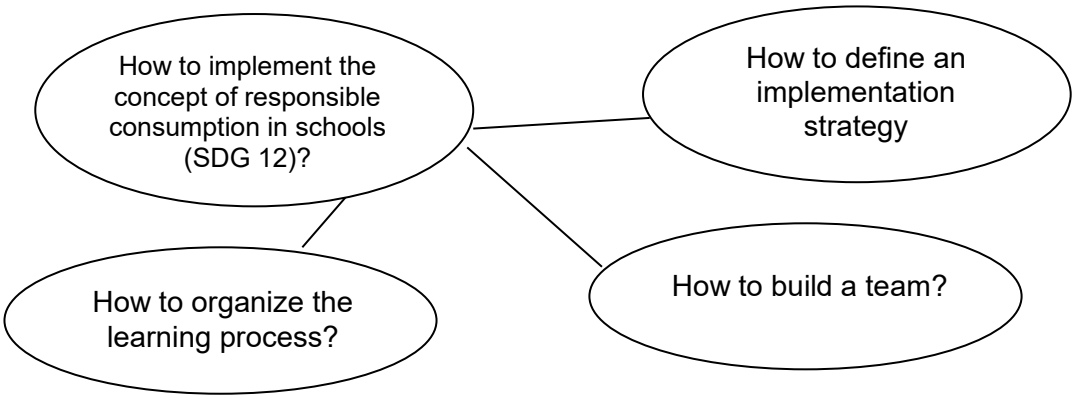


To save time, instead of the word "How?" you can write one letter "H" or just a question mark. Anything that speeds up the process of writing down ideas, contributes to an increase in the effectiveness of the technique in general and the emergence of new ideas.

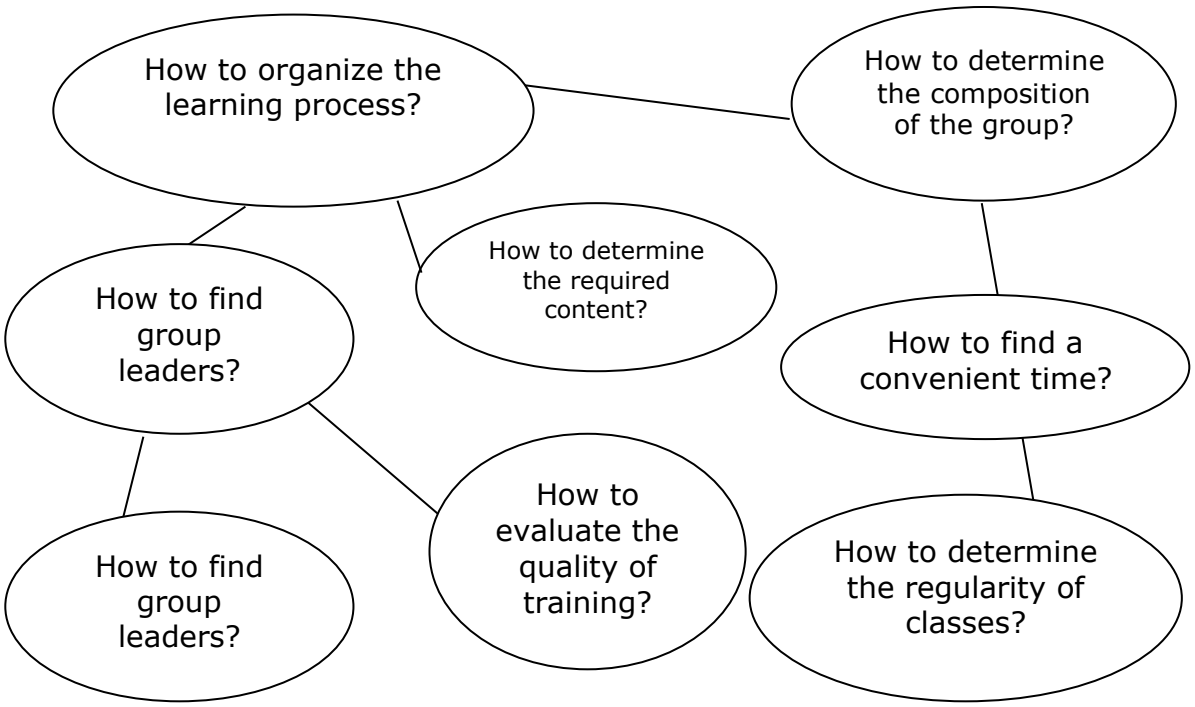
Getting an overview of the problem is very helpful. You can literally take a look at all the available possibilities for solving it. You look at the current situation from a global perspective, which, of course, is better and more convenient than a to-do list.

Let's consider a more complex example, where the hierarchical diagram "How?" begins to work with questions and solutions at a strategic level.

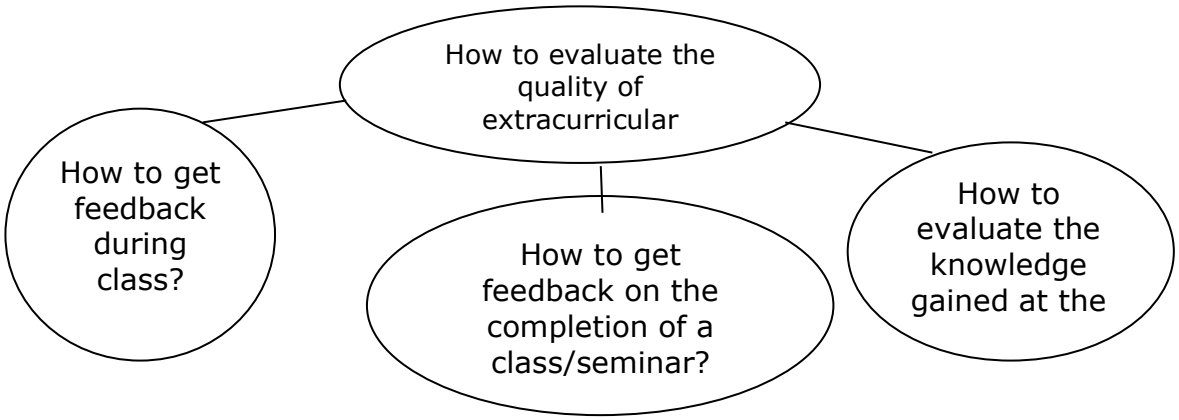
Highest level of problem solving



Medium problem solving



The lowest level of problem solving corresponding to the priority list.



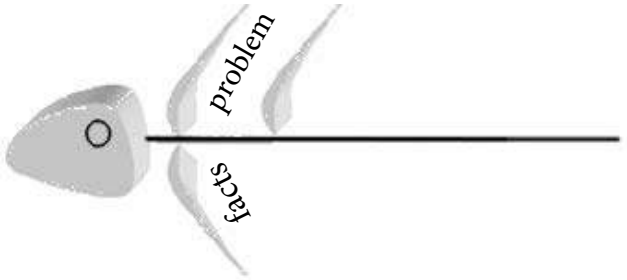
Hierarchical chart "How?" Is a flexible and convenient technique that ensures that you can find a solution to almost any problem as long as you ask yourself the right questions.

Recommendations for use

1. Write down your ideas quickly and intuitively. Otherwise, you will begin to evaluate certain ideas, compare them with each other and, which is very likely, cut off the flow of creative ideas.
2. The diagram is never completely finished, you can add new ideas and solutions to the existing diagram.
3. The same questions may be repeated in the diagram. If the question is repeated, then it represents something important. Maybe it even turns out to be a key step towards solving the whole problem.
4. You can graphically capture new ideas in the form of a tree or a cascade, from top to bottom or from left to right. The main thing to remember is that the best way for you will be the one that will help you find the largest number of useful ideas and solutions.

Fish skeleton strategy

This model of formulating and solving a problem allows you to describe and try to solve a whole range of problems.



Recommendations for use. On the top "bone" is written the wording of the problem, and on the bottom - facts confirming that the problem exists. Work (research) can be carried out individually or in groups. For example, at the top of the skeleton, you might ask students to list environmental problems, and at the bottom, write down solutions to those environmental problems. An important stage will be the presentation of the completed diagram, which will demonstrate the interrelation of problems, their complex nature.

You can independently determine the course of further work - this may be an exit for further research or an attempt to solve the described problems. We present a development where two strategies are combined.

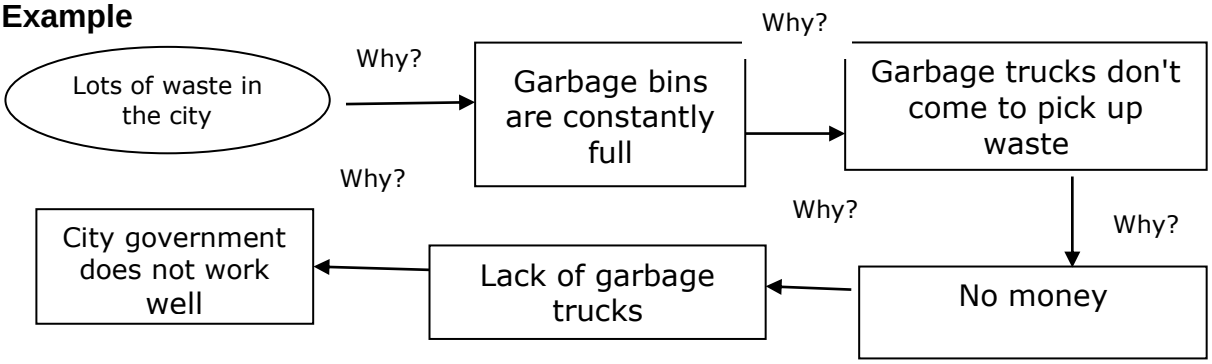
What is the main problem that students need to solve?	**What important information does the student have? (Indicate sources of information)**
What additional information will students receive in the group?	What methods do the students suggest to solve the problem?
Which way do you think is the best? Why?	What are the best options for you?

Technique "Why?"

A technique called "Why?" Is a whole chain of reasoning, the purpose of which is to identify the root cause of the problem.

When applying this technique, you must start with a problem statement that is obvious. Then you draw an arrow asking "Why?" and behind it, write the answer to the question that comes to your mind. This process continues until you reach the hidden cause of the problem.

Example



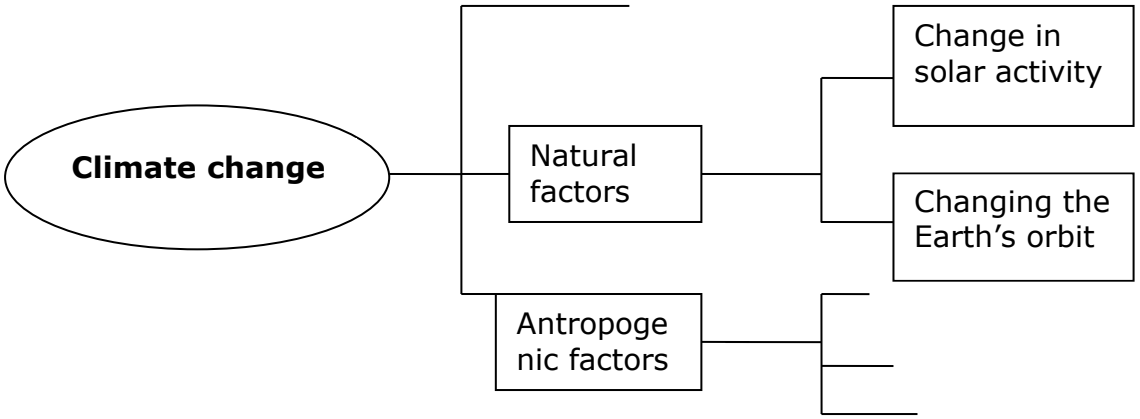
Recommendations for use

1. You should write down the answers that first come to your mind.
2. Choose which icons to use: circles or rectangles.
3. Non-linear circuits can be used (the example above shows a linear circuit). For example, you can depict such schemes in the form of a spiral (placing the starting position in the centre of the sheet or, conversely, at the edge) or build a chain of reasoning from right to left. An arrow indicates a direction of thinking.

Technique "Cascade"

This technique allows you to identify the structure of hierarchical ideas.

Example:



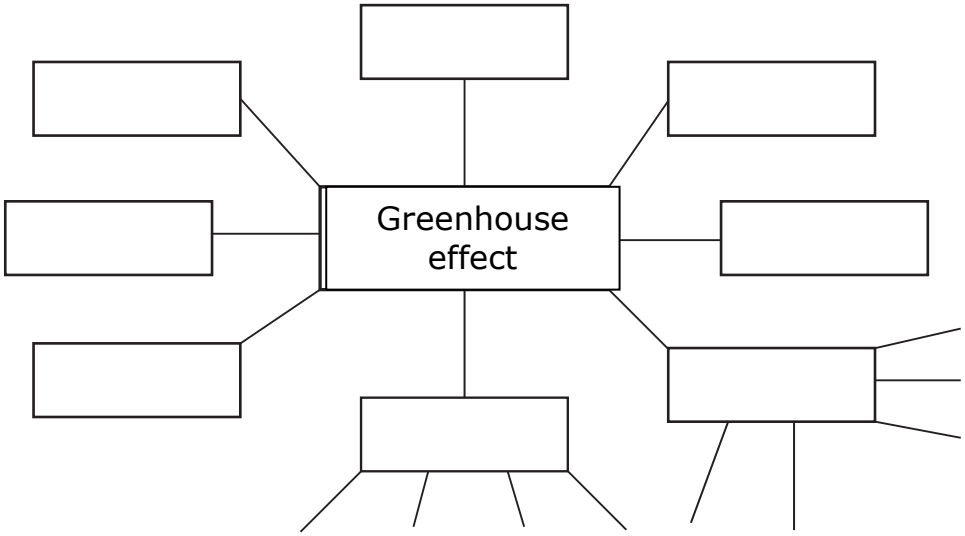
Recommendations for use

1. In the process of drawing up the "cascade" it is possible to move some parts of the diagram - this will allow to rethink certain of its provisions.
2. In the event that you cannot find the answers to the question, you can always return to the previous levels and see if something is missing.

Technique "Pyramid"

"Pyramid" is another method of hierarchical presentation of ideas, when small branches depart from the main ideas and provisions, which serve for a more detailed consideration of the secondary points of the problem or task.

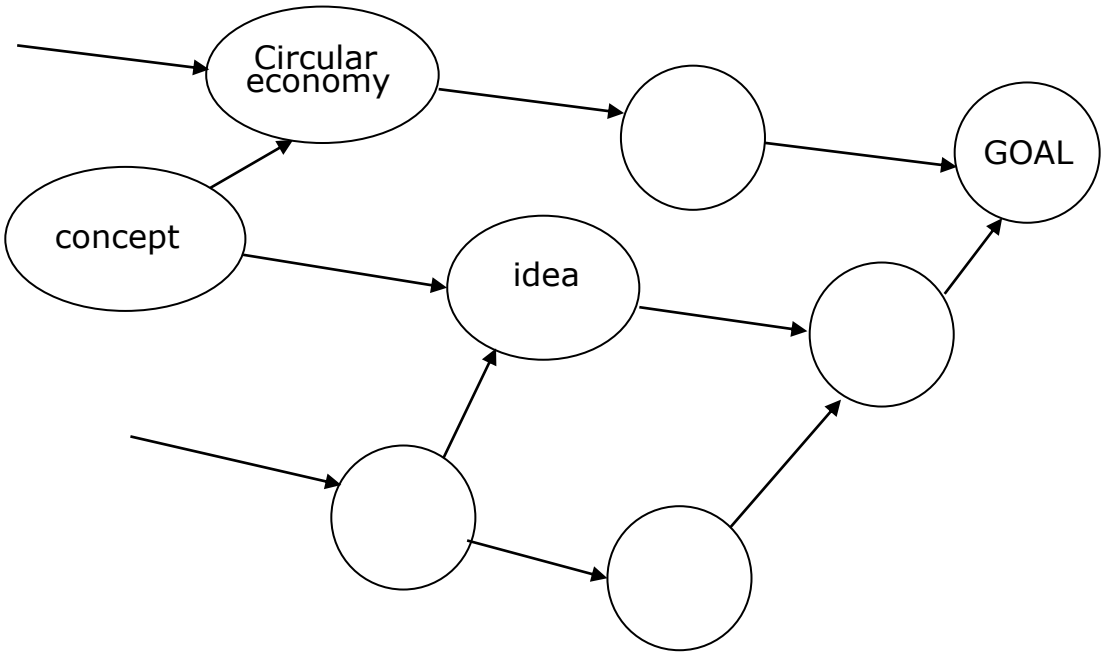
Example



Fan of Opportunities technique

The Fan of Opportunities technique can be used both in solving complex problems and in planning complex events.

Example:

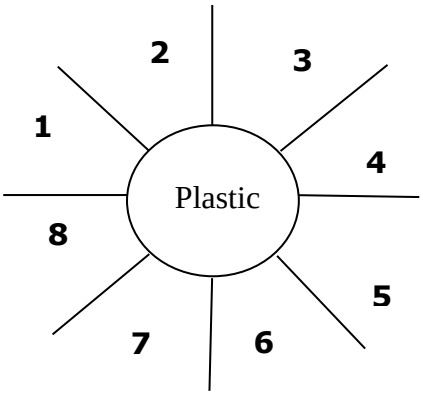


Recommendations for use

1. One must start by stating a problem or goal.
2. Then you can go in the opposite direction to find in the end the true cause of the problem.
3. When planning activities, you can also go backwards, writing down tasks in descending order to clearly establish what should precede the achievement of intermediate results and the final goal as a whole.
4. As you analyse, you will find that only two or three branches are of value.

Wheel of Ideas technique

The "wheel of ideas" is based on the principle, where an indispensable condition is to list a certain number of ideas for solving a problem (there are eight of them in this technique). Example:



Recommendations for use

1. In the centre, you write down the problem or task that needs to be solved.
2. Eight is a compromise, not a big number to despair if you suddenly fail to find so many ideas right away. The "wheel of ideas" can consist of a different number of spokes: 4 - 7; or 12 - it all depends on your determination to solve the problem.

SWOT analysis

Today it is the most popular method for analyzing the situation. Its name is made up of the first letters of the English words **S**trengths, **W**eaknesses, **O**pportunities and **T**hreats.

For example, you need to conduct an environmental campaign at a school. And in order to carry it out, you first need to analyze the preparedness of the class, the school for organizing events, i.e. the current situation needs to be clarified. Strengths can serve as a basis for organizing events, weaknesses provide opportunities to look for other options, and the column “opportunities” will help to address weaknesses. The column "threat" gives information for what you need to be prepared for; foresee.

S (strengths)	**W (weaknesses)**
• Pupils regularly take part in environmental campaigns and hikes. • They always participate in an active and orderly manner. • The team of this class is friendly.	• They are busy preparing for the Olympiad, exams, etc.; • Students of this class are free only on Saturday and weekends.
(opportunities)	**T (threats)**
• It is possible to create a group of students from different classes. • You can attract leaders of grades 7-9 to organize an action.	• changing weather conditions.

SECTION 2. ORGANIZATION OF INDEPENDENT ACTIVITIES OF STUDENTS

The independent activity of students is associated with the solution of a creative, research problem with a previously unknown result. This type of activity presupposes the presence of the main stages: formulation of the problem, study of the theory devoted to this issue, selection of research methods and practical mastery of them, collection of our own material, its analysis and generalization, commentary, own conclusions.

2.1. PROJECT ACTIVITY OF STUDENTS

The project activity of students is a joint educational, cognitive, creative activity with a common goal, methods, methods of activity aimed at achieving a common result. A prerequisite for project activities is the presence of pre-developed plans for the final product of activities, design stages (development of an idea, definition of goals and objectives, resources, creation of a plan for project implementation) and project implementation.

When solving problems in the field of energy conservation and responsible consumption, projects are of great relevance, the main stages of which *are:*

1. Determining the need "How can I do it better?"
2. Determination of criteria for the effectiveness of the results of work.
3. Research and literature search: what has been done on this problem, what products already exist, what are their advantages and disadvantages?
4. Developing a plan, finding the necessary resources, determining the cost, considering the conditions for the successful implementation of the project.
5. Implementation and evaluation of the initial result of the project idea. Assessment of suitability and applicability.
6. Correction (if necessary).
7. Presentation of results.

The purpose of the project activity is the implementation of the project idea, which has the following sequence:

1. Definition, object and subject of research.
2. Formulation of the topic, problem, justification of their relevance.
3. Study of literature.
4. Putting forward a hypothesis.
5. Formulation of the goal and objectives of the study.
6. Definition of research methods.
7. Conducting research.
8. Registration of work.
9. Presentation (protection) of research results.

Let's consider this sequence of actions in more detail..

1. Definition of the object and subject of research. An object is a sphere of science and practice, an area of human life in which the object of research is located. In school practice, it can correspond to a particular academic subject, for example: mathematics, biology, physics, history, or be interdisciplinary in nature, for example: energy saving, ecology, etc.

The object of research is a certain process or phenomenon that generates a problem situation. An object is a kind of bearer of the problem - what the research activity is aimed

at. For example, if the object area is "energy saving", then the object of research can be a household, school, village.

The research subject is a specific part of the object within which the search is conducted. The subject of research can be phenomena as a whole, their individual aspects, aspects and relations between individual parties and the whole. It is the subject of research that determines the topic of the work. For example, when studying a home apartment from the point of view of energy saving, the subject of research can be certain aspects of this problem: the structure of energy consumption (water consumption), the behaviour of family members to consume water, heat, electricity, the cooking process, and light sources.

2. Formulation of the topic, problems, justification of their relevance. The ancient Greek word "problem" is translated as a task, obstacle, difficulty. A problematic situation is knowledge of ignorance, discrepancy or contradiction between knowledge of the needs of people and some effective practical or theoretical actions and ignorance of the ways, means, methods, methods, techniques for implementing these necessary actions. The topic is a kind of visiting card of the study. An obligatory requirement for any work is a substantiation of the relevance of the study. An indicator of relevance is the presence of a problem in this area of research.

A few useful tips when formulating a work topic:

1. The chosen topic should be of interest to both the student and the teacher.
2. It is necessary to take into account the real level of preparedness of the student to complete an independent task
3. The chosen topic must be realizable in the existing conditions (equipment, literature, consultants are available).
4. The problem should be significant and relevant (compliance with the needs of the time, the possibility of applying the studied ideas and provisions to the surrounding reality).
5. Research must contain elements of novelty.
6. The formulation of the topic should orient the student towards independent research.
7. When formulating a topic, you should adhere to the rule: the narrower it is, the more words are contained in the wording of the topic. The small number of words indicates its vagueness, lack of concreteness in the content of the work. While researching a specific topic, students should study as much as possible a sufficiently wide range of literature and other sources of information: popular science publications, scientific, reference, non-fiction literature, periodicals, Internet sources and others.

3. Putting a hypothesis. Having studied the literature, having received an initial acquaintance with the problem, the student can begin to put forward a hypothesis. *“Hypothesis” in translation from ancient Greek means “base”, “assumption.” “Hypothesis” must satisfy a number of requirements:*

- to be verifiable;
- to contain a guess;
- to be logically consistent;
- to fit the facts.

4. Formulation of the goal and objectives of the study. The purpose of the study is the intended result. The purpose of the research activity should be formulated briefly, in one sentence. When forming a goal, the verbs "prove", "justify", "establish", "clarify", "find out", "define", "develop", etc. can be used. To achieve this goal and test the hypothesis, specific research tasks are identified. Objectives are best formulated as statements of what needs to be done to achieve the goal. The list of tasks is based on the principle: from the

least difficult to the most difficult, time consuming. When formulating tasks, it is advisable to use the verbs "analyse", "describe", "reveal".

5. Definition of research methods. *A method is a way to achieve a research goal.* The methods of scientific knowledge are divided into general and special. General methods - analysis, observation, measurement, comparison, experiment, simulation, etc.

Observation is an active cognitive process. The sequence of actions when conducting observations:

- determine the object of observation;
- determine the purpose of the observation;
- find out the conditions necessary for a successful observation;
- draw up an observation plan;
- think over a way to register the information received (table, graph);
- describe the signs of the observed processes;
- analyze the new processes obtained;
- formulate and write conclusions.

Comparison is one of the most common methods of cognition. Comparison allows you to establish the similarity and difference of objects and phenomena.

Experiment — involves intervention in the natural conditions of the existence of objects and phenomena or the reproduction of certain aspects of them in specially created conditions, in order to study them. The experiment is carried out most often to test the hypothesis put forward.

Mathematical methods: statistical, methods and models of graph theory and network modeling; methods and models of dynamic programming; methods and models of queuing; data visualization method (functions, graphs, etc.).

6. Conducting research. The content of the experimental part depends on the object of research, the topic of work and the chosen methods. Following the experiment, the technological stage of the work, it is necessary to analyse the results obtained, to what extent they allow to confirm the hypothesis put forward at the beginning of the study, to clarify their compliance with the set goals.

7. Generalization of research results. The materials obtained as a result of the research are systematized in the form of tables, graphs or figures, illustrations. Conclusions on the practical part of the study are formulated. The conclusion should contain a brief general overview of the problem, proposals for the practical use of the results. The presentation of research results is a description of the results obtained. A project or research work is written approximately according to the same plan:

- title page;
- table of contents;
- introduction, in which the purpose of the work is set and substantiated, tasks are formulated;
- a description of the materials and techniques that you used;
- presentation of the results obtained;
- their discussion;
- conclusion (final conclusions);
- list of used literature.

2.2. PRACTICAL RECOMMENDATIONS FOR THE ORGANIZATION OF INDEPENDENT WORKS OF STUDENTS

1. Preparation of a report for the competition (conference).

An important stage of any work is the public protection (presentation) of its results. It should be remembered that protection in no case should be limited to retelling the entire content of the work. It is better to start preparing a report by thinking over its structure. The report can be conditionally divided into three parts:

Part I: justification of the choice of the topic, its relevance; description of the problem, ways of working on it; goal setting and task formulation.

Part II: providing a summary of the chapters; novelty of work (study of little-known sources, putting forward certain versions, new approaches to solving the problem); presentation of the main results of the research carried out.

Part III: main findings of the research; proposals for the practical use of the results, ways of solving the investigated problem; prospects for further research.

For clarity of the report, it is recommended to use tables, graphs, figures, visual aids, but their use should be carefully thought out. As a rule, a report is given no more than 5-7 minutes, and it needs to be rehearsed.

2. Laboratory work and mini-research in the classroom.

Mini-study "How does the air move in a room?"

Purpose: to study the distribution of air in a room.

Materials: tissue paper, fishing line (twine), scissors, scotch tape.

Fact-finding phase: Research is best done during the winter heating season. Hang narrow strips of tissue paper onto the line (twine) with tape. Fasten the fishing line taut by the window, by the door, so that it hangs from ceiling to floor. Write down how the leaves move. Open the window and repeat the experiment. Open the door. Has the leaflet behaviour changed? Describe what you observed.

Problem: Why did the stripes move differently?

Hypothesis: Try experimenting with your hypothesis. Describe it and your results. Make the appropriate conclusions.

Answer the questions: why are the radiators placed at the bottom and the vents at the top? what physical phenomenon did you observe in the room and what is its cause?

3. Mini-study "How to keep warm?"

Objective: To study various ways to conserve heat.

Materials and equipment: a thermometer, five identical jars with lids, hot water, newspapers, a woolen scarf (sweater), a cardboard box slightly larger than a jar, metal foil.

Fact gathering stage:

1. Fill all jars with hot water to the same level.
2. Leave the jar open, close the second with a lid, close the third with a lid and wrap a scarf, the fourth with foil, place the fifth in a cardboard box, wrap the sixth in newspaper.
3. Take all jars to a cool place.
4. Measure the temperature every 10 minutes.
5. Fill in the table:

Jar	Initial water temperature	Water temperature after 10 minutes	Water temperature after 20 minutes	Change in water temperature
Open				
Closed				
With scarf				
In foil				
In the box				
In the newspaper				

Problem: Why did the water cool differently?

Hypothesis: Try experimenting with your hypotheses. Explain the observed phenomena.

4. Experimental Study No. 1

Purpose of the work: to investigate the features of boiling water in open and closed vessels.

Equipment: an electric kettle in which one litre of water is poured, a clock, a thermometer.

Fact gathering stage:

Pour one litre of water into the kettle and turn it on.

Record the amount of time until boiling in the kettle with the lids open and closed.

Calculate the energy spent in the first case $A_1 = Pt_1$ and in the second case $A_2 = Pt_2$;

P — power of the kettle (determined by the passport).

Calculate $A = Pt_1 - Pt_2 = ...$ J.

Draw graphically the difference in kettle heating in both cases.

Problem: why is the energy different in both cases?

Hypothesis: Test hypotheses by experiment. Explain the observed phenomena.

5. Experimental Study No. 2

Purpose of work: to find out how much energy is saved if you use a pan with a flat bottom, and not a pan with an uneven bottom (all other things being the same).

Equipment: two pots, one with a flat and one with an uneven bottom, electric stove, stopwatch, 2 litres of water at room temperature.

Fact gathering stage:

1. Take two pots (one with a flat and flat bottom, the other with an uneven bottom).
2. Pour 1 litre of room temperature water into both pans.
3. Place both pots on the same hotplate and measure the heating and boiling time of the water.
4. Using the formula $A = P \cdot t$ (P - in kW according to the passport, t - in hours) calculate the work of the current.
5. Ask your parents the cost of one kWh and calculate the cost of heating in both cases.
6. Calculate your savings for the week, month and year and draw a conclusion.
7. There is an assumption that the electricity consumption will be less if the area of the bottom of the pan is equal to the area of the burner. How do you check this assumption?

6. Experimental Study No. 3

Purpose: to study the time of boiling water in electric kettles of different capacities.

Materials and equipment: two electric kettles of different power (the power should differ

significantly), two litres of water at room temperature, a thermometer, a stopwatch.

Fact gathering stage:

1. Pour one litre of water into both kettles at the same starting temperature (room temperature).
2. Turn on kettles at the same time.
3. Record the heating time of the water in each kettle to the boiling point.

7. Experimental study No. 4

Objective: to study the factors affecting energy savings when cooking in the home kitchen.

Equipment: two pots with different bottom diameters; two pots with the same bottom diameter, but different colours: dark and light; two identical pans; two thermometers; clock; heating elements of the same size and power (the same hob burners).

Research stages:

1. Take two pots of different diameters, pour one litre of water into them and place a thermometer inside each pot.
2. Determine the boiling time of the water in the pots when the temperature reaches 100 ° C and calculate the time difference.
3. Calculate the saved electricity by the difference in the time of boiling water in pots of different bottom diameters, according to the formula A = P · t in kW · h (where the power must be taken from the passport data of the electric stove).
4. Analyse and explain the findings of the study.
5. Take two pots of light and dark colour and add one litre of water, put a thermometer inside each pot.
6. Perform points 2-4 of the study.
7. Take two identical pots: cover one with a lid, leave the other open, pour one litre of water and put a thermometer inside each pot.
8. Perform points 2-4 of the study.
9. Make a conclusion about the factors affecting energy savings when cooking in pots, and make a calculation of the total savings in terms of following your recommendations.

8. Home experimental research (sample topics)

1. Explore the possibility of saving water when taking a bath (shower).
2. Investigate household energy consumption for a month (monitoring meter readings).
3. Estimate the cost of washing clothes in a washing machine during the week, month, year.
4. Determine the structure of water consumption in the household in different periods of the year, etc.

Students are invited to determine the purpose of the study themselves, formulate a problem, put forward a hypothesis, and draw up a work plan. The results are presented in the form of graphs, diagrams. The results of these experimental studies can be applied in the following student projects:

- Development of recommendations for saving water at home (at school).
- Development of recommendations (memos) for saving energy in the kitchen, in the apartment.
- Production of information posters (flyers) on water and energy saving.

CONCLUSION

The toolkit is designed to help teachers understand how education, in particular ESD, can contribute to the achievement of the Sustainable Development Goals. It formulates specific recommendations, learning objectives, offers topics and practical tasks on responsible consumption and environmental protection, and also describes the process of implementing this work in different forms: carrying out extracurricular activities, project activities, mini-research, etc.

The manual presents questions on the organization of studies and design and creative activities of students. Considered and proposed recommendations for conducting classes of a different nature, according to their content, structure of lessons and research of students, involving the study of the problems of energy conservation, responsible consumption, they should be built in accordance with these requirements. The introduction of energy conservation and responsible consumption into the content of work with students has a significant educational potential, with appropriate organization, it can ensure the formation of energy-saving and resource-saving behaviour of students.

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