

Improvement of Practical Courses in Ecology and Environment Protection on the Base of Innovative Technologies

Sh.T. Yakubjonova¹, B.B. Ishmuminov², D.Bokiyev³, M.A.Isabekova⁴

¹PhD, Assistant Professor of the Department of Botany and Ecology of Tashkent State Pedagogical University named after Nizami, Tashkent, Uzbekistan,

²Teacher of the Department of Botany Ecology of Tashkent State Pedagogical University named after Nizami, Tashkent, Uzbekistan

³PhD, Assistant Professor of the Department of Botany and Ecology of Tashkent State Pedagogical University named after Nizami, Tashkent, Uzbekistan,

⁴Senior teacher of the Department of Botany and Ecology of Tashkent State Pedagogical University named after Nizami, Tashkent, Uzbekistan

Abstract. *In the article, the experience of using innovative technologies in order to achieve effective results in the teaching of ecology and environmental protection thereby improving the practical training organized in these subjects is given. The article can be an important helper in developing their theoretical knowledge, justifying the ecological situation of the environment, and applying the knowledge they have acquired about nature. The article shows how to conduct practical training on ecology as an example of a topic. It is also possible to use the development of the given lesson in independent work, in extracurricular activities, in scientific and practical circles. Experiments in lesson development can be done both in the field and in the laboratory.*

Key words: *ecology, environmental protection, innovative technology, ecological factors, light, humidity, temperature, heliophytes, sciophytes, thermophile, psychrophile, hydatophyte, hydrophyte, hygrophyte, mesophyte, xerophyte, homoiotherm, heterotherm, poikilotherm.*

1. Introduction

Students can get theoretical materials from many sources, such as lectures, scientific literature, and the Internet. Competence and skills to process the received information and use it in practice are formed only through effectively designed practical and laboratory training [1]. Therefore, in recent years, it has become an urgent issue to increase the importance of research and development based on a deep analysis and a modern approach to the organization of practical and laboratory training.

The purpose of the study. The goal of our research is to improve practical training and achieve effective results through the use of innovative technologies.

Research method. Observation, comparison and experimental methods, "Small group teaching" method of collaborative teaching technology were used in scientific research.

The main part. In the article, we would like to refer to the lesson development on the topic "Main environmental factors" developed on the basis of the practical results obtained from our research on improving the teaching of practical training.

Purpose of practical training. Studying the adaptations of organisms as a result of the

types of main abiotic factors and their impact on living organisms, and identifying ecological groups.

Materials and equipment. Plant pictures of different ecological groups, plant herbariums, ruler, magnifying glass, thematic tables.

Theoretical material. Various factors found in the natural environment can be divided into 3 main ecological groups: 1. Abiotic 2. Biotic 3. Group of anthropogenic factors.

1. Abiotic factors are total factors of the inorganic environment that affect organisms. These factors can be divided into chemical (atmosphere composition, water salinity, soil composition, chemical composition of mud), physical or climatic (temperature, pressure, light, humidity, wind) factors. The structure of the earth's surface (relief), the diversity of geological and climatic abiotic factors is of great importance in the historical development of living organisms and their adaptation to the environment.

2. Biotic factors are life activities of organisms found in the environment, their influence on each other and their relationships, that is, the various effects of other living creatures surrounding one living organism are understood. This effect can have different expressions. For example: 1. Living organisms are a source of food for each other (plants are food for various animals, fodder; some animals are food for predators); 2). The body of one living organism is a host-parasite for another organism (cow, horse, dog, tick, bacteria; large trees are mosses and other epiphytic plants); 3). One organism causes the reproduction of another organism; 4). The spread of different organisms with the help of other organisms; 5). Physical and chemical effects of one species on another species.

3. Anthropogenic factors are the impact of human activities on the organic world. With the development of society, new types of human influence on nature appear, and negative environmental changes begin to be felt in the environment [2].

A number of processes occur in organisms under the influence of light, which is one of the main environmental factors (see Table 1).

Table 1 The most important processes in plants and animals under the influence of light

1.	Photosynthesis	The plant absorbs about 1-5% of the incident light. Photosynthesis is the source of energy in the food chain for all living organisms. Light is also necessary for the accumulation of chlorophyll.
2.	Transpiration	75% of the sunlight falling on the plant is used to evaporate water from the plant. This accelerates water evaporation. This situation is important in solving the water problem at the present time.
3.	Photoperiodicity	It is important for the harmony of plant and animal life (especially during reproduction).
4.	Movement	Phototropism and photonasties observed in plants are important in providing the plant with sufficient light. Phototaxis plays a role in choosing a specific habitat in unicellular plants and animals.
5.	Animal vision	It is one of the most important functions in the body.
6.	Other processes	Protective adaptations such as vitamin D synthesis and skin darkening in humans. Behavioral actions such as avoiding direct sunlight.

Plants can be divided into three groups according to their reaction to light:

1. Light-loving (heliophyte) plants. They can grow and develop normally only when there is enough light. Such plants include plants of the steppe, desert regions, sedges and some other species, tall trees that form the first layer of the forest plant community, Central Asia ephemeroid type of life forms of short-growing perennial grasses in the conditions and

others.

2. Soy-loving (styophytes) plants. They are plants that grow in places with weak light. These include species growing in the lower layers of vegetation, mosses, ferns, ferns, wild henna growing under walnut groves, and mountain sunflower. Light-loving and shade-loving plants differ from each other in their morphological, anatomical and physiological characteristics.

3. Shade-tolerant or facultative heliophyte plants. Although most of them are light-loving, they are species that grow and develop normally even when there is not enough light, and when there is too much light. They can include blackberry, strawberry, purple and others [3].

All plants can be divided into two ecological groups according to their response to temperature: thermophilic plants, which grow well under the influence of high temperatures, and psychrophilic plants, which live under the influence of low temperatures. Plant species belonging to both groups have their own adaptation characteristics. The cell of thermophilic plants is characterized by heat resistance, reduction of the surface of organs, well-developed hairs, essential oils, excretion of excess salts, long-term dormancy, and other features. Psychrophilic plants tolerate cold conditions in different situations (i.e. during dormancy or vegetation) through anatomical and morphological adaptation. Such adaptations include the growth of the stem, the horizontal direction of the branch, the location of the gathering joint and the root neck under the ground, water absorption, good development of the pod layer, and having a white body. can be shown.

Organisms are divided into four groups according to their demand for water, living in different moisture conditions and their adaptation: 1. Living in water (plants-hydrophytes, animals-hydrophiles). 2. Those who live in excess moisture (hygrophytes, hygrophiles). 3. Those who live in moderate humidity (mesophytes, mesophiles). 4. People living in arid conditions (xerophytes, xerophiles).

All plants are divided into 5 ecological groups according to water supply or adaptation to moisture conditions: hydatophytes, hydrophytes, hygrophytes, mesophytes, xerophytes.

Hydatophytes are aquatic organisms, this group mainly includes algae.

Hydrophytes are plants with part of their body outside the water and the rest in the water layer. Among them are water lilies, nettles, spearmint, oleander and others.

Hygrophytes are plants that live in conditions with excess moisture or water in the soil. They are plants that grow on the banks of rivers and lakes, swamps, dense forests and other places.

Mesophytes are plants that grow in moderately humid conditions, including most cultivated and wild plants.

Xerophytes are plants adapted to living in arid conditions. Common in steppe, desert and semi-desert regions, these plants are divided into 2 groups: sclerophytes and succulents. Sclerophytes are found in Central Asian deserts, while succulents are cacti that store water in their bodies.

Depending on humidity, organisms have a number of adaptations (see Table 2).

Table 2

Physiological adaptations in organisms to humidity

Organisms	Adjustments
Insects (beetles, wasps, ants)	One end of the excretory organ (Malpigi tubules) is attached to the back walls of the intestine, water is reabsorbed by the body through absorption.
Bees, butterflies and flies	It is fed with liquid food, excess salts and urea are removed through urine

Reptiles (turtles), birds	It excretes undissolved uric acid
Spiders	Releases guanine
Hydrobionts - lichens, mushrooms, acidophiles, mussels, crustaceans	Filters water - cools and cleans 150-280 m ³ of water overnight
Poikilotherophytes, algae, mosses, lichens	During dry periods, they dry up and enter the state of anabiosis, and restore their state during rainfall.
Turtles in the Galapagos Islands, frogs in the Australian deserts	Stores water in the bladder
Such as Yumronkozik	In drought, it digs a deep nest and goes into hibernation due to the accumulated fat in its body
Camels	Metabolically breaks down accumulated fat
Invertebrates	During the dry season, it turns into a cyst or thick-skinned spore

Order of work

1. Using the text, identify abiotic factors and their main types.
2. To study the effect of light and temperature factors on plants, pictures, wet preparations, plant herbariums are used. Morphological characteristics of plants (leaf shape, size, degree of hairiness, thickness) are studied, and a conclusion is made about which group they belong to.
3. The humidity of plants and animals is studied based on the root system of plants, the shape of the leaves, which group they belong to is determined.
4. Based on the obtained results, a conclusion is drawn.

Assignments

Task I. In the assignment, ecological groups of organisms and their specific characteristics and signs are studied according to the factor of light and temperature. Students are divided into 4 groups and each group is given separate tasks [4].

Assignment for group 1. Analyze the most important processes in organisms under the influence of sunlight and fill in Table 3 based on the sample.

Table 3

Procedures	Analysis
Fotosintez	The plant absorbs approximately 1-5% of the incident light. Photosynthesis is the source of energy in the food chain for all living organisms. Light is also necessary for the accumulation of chlorophyll.

Assignment for group 2. According to the morphological characteristics of plants, based on the following picture 1 and herbariums, distinguish the characteristic features of the plant group strongly adapted to the influence of the light factor and fill in table 4.

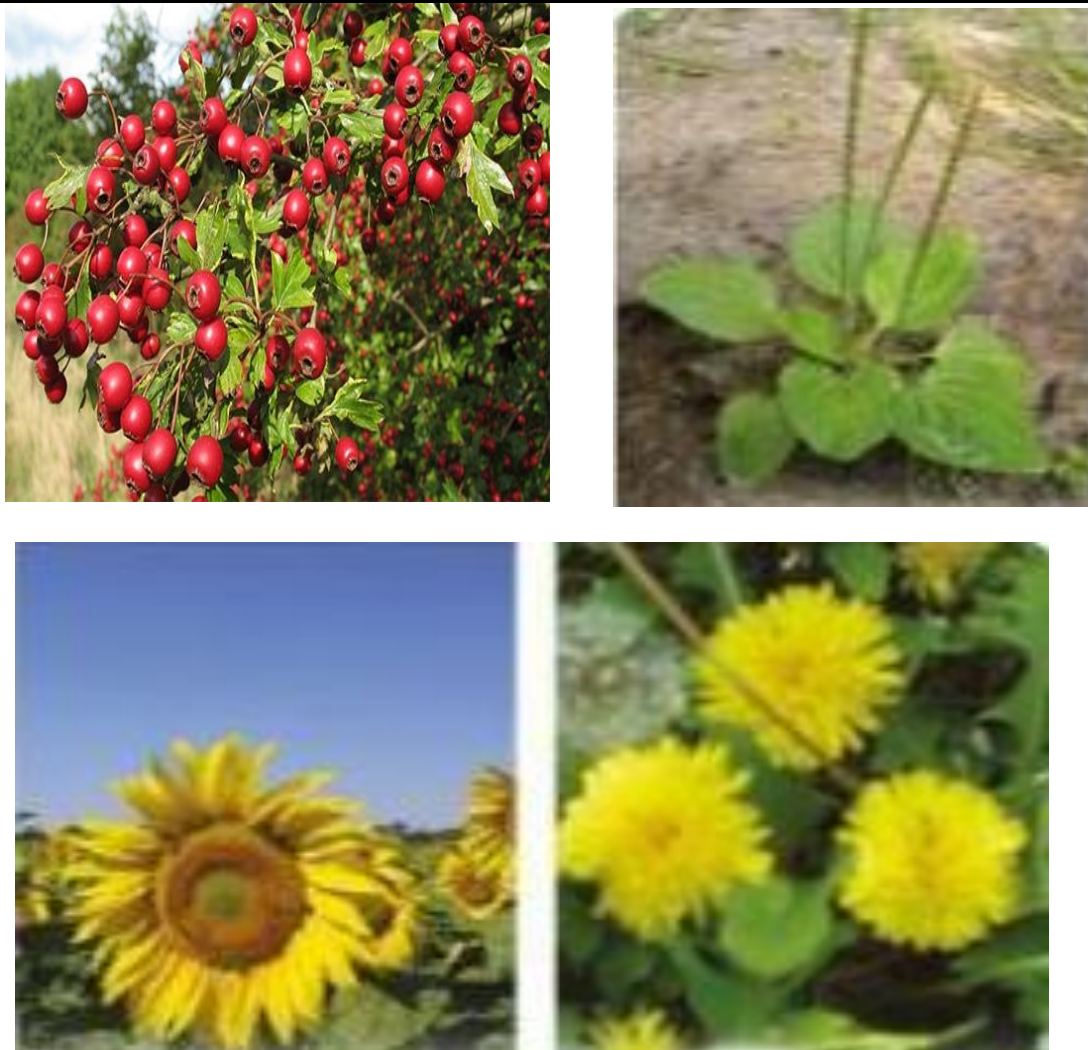


Figure 1. Heliophytes.

Table 4

	Heliophytes	Species belonging to the group
1.		
2.		
3.		
4.		

Assignment for group 3. Identify the morphological characteristics of plants growing in the shade (at least 4 plants) using the following figure 2 and the text of the lecture and fill in table 5.



Figure 2. Sciophytes.

Table 5

	Sciophytes	Types of styophytes
1.		
2.		
3.		
4.		

Table 6

Assignment for group 4. Study the characteristics of ecological groups of animals adapted to the temperature factor and fill in Table 6.

Ecological groups	Types	Characteristics
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Homotherms		
Heterotherms		
Poikilotherms		

Assignment II. In the assignment, the characteristics and signs of adaptation of plants and animals to the humidity factor are studied. Students are divided into three groups and each group is given separate tasks [5].

Assignment for group 1. Based on the given plant samples, distinguish the morphological characteristics of plants growing in moisture, determine the name and write the collected data on the characteristics in Table 7.

Table 6

Ecological groups	Representatives	Characteristics of the ecological group
Hydatophytes		
Hydrophytes		
Hygrophytes		
Mesophytes		
Xerophytes		

Assignment for group 2. Determine the physiological adaptations of organisms to moisture and fill in Table 7.

Table 7

Organisms	Compatibility signs
Insects (beetles, wasps, ants)	
Bees, butterflies and flies	
Reptiles (turtles), birds	
Spiders	
Hydrobionts - lichens, mishankas, mussels, crustaceans	

Table 8

Assignment for group 3.

Determine the physiological adaptations of organisms to humidity and fill in

Organisms	Compatibility signs
Poikiloxerophytes, algae, mosses, lichens	
Turtles in the Galapagos Islands, frogs in the Australian deserts	
Such as Yumronkozik	
Camels	
Invertebrates	

According to the results of the assignments, students will be evaluated and the following control questions will be given for homework.

Control questions

1. Types of adaptation of living organisms to the external environment?
2. Name the most important processes in organisms under the influence of sunlight?

3. Name the ecological groups of living organisms according to their reaction to light?
4. Living organisms are divided into several groups according to the temperature factor

5. What is the importance of water for living organisms?

6. What groups of living organisms exist according to the moisture factor?

Since the topic "Main environmental factors" is a topic that includes many issues, it is advisable to study it in 4 or 6 hours. The rest of the topics can be developed based on the experience given above.

Summary. In conclusion, it can be said that the above-mentioned practical exercise on one topic and the development of the lesson will help students to strengthen their theoretical knowledge and develop the ability to work with literature. Also, future teachers have important practical importance in organizing and conducting ecology classes.

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