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TEACHING THE LYCOPODIOPHYTA DIVISION BASED ON BLOOM'S TAXONOMY IN HIGHER PLANTS MODULE

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ABSTRACT

This article discusses teaching the lycopodiophyta division based on bloom's taxonomy in higher plants module. It is known that previously, laboratory training on the topic of botany was organized only through plant herbariums. However, the use of pedagogical technologies to strengthen the subject was a very small percentage. Today, laboratory training is conducted not only on the basis of herbarium specimens, but also on the basis of advanced pedagogical technologies based on Bloom's taxonomy.

KEYWORDS

Bloom's taxonomy, plants module, lycopodiophyta.

INTRODUCTION

The teacher organizes, manages, controls, evaluates the cognitive activities of students in the educational process and creates a basis for the comprehensive development of the individual through the implementation of the educational, educational and developmental goals envisaged by the teaching [2].

We can see, that today, due to the use of advanced pedagogical technologies and new generation technologies related to science, great progress has been made in the field of biology in higher education. Advances in electron microscopy and related techniques have greatly contributed to the current knowledge of biology. On the other hand, learning

techniques are ultimately used to create 3D physical models.

3D electron microscopy techniques and 3D prototyping technology (3D printing) were developed, resulting in modernization of cell biology teaching. Further developments in teaching mode included the integration of multimedia technology in teaching. It was found that the introduction of multimedia technology in the teaching of biology significantly improved the learning of students. We will analyze that the integration of multimedia technologies and teaching has changed the teaching strategy in educational institutions. Advances in computer applications and curriculum have greatly enhanced the learning process. Interactive cloud computing models have been used to solve various biological problems. Such models enriched the content of teaching and increased the effectiveness of teaching [1].

It is very necessary to use new technologies to prevent sudden destruction of vegetation and preserve

pastures. Because it is important for the future generation to preserve the range of high plants growing in pastures. Because of the degradation of 6-10% of pastures per unit area per year due to the impact of human factors are raising [4]. This position on the restoration have been carried out in several countries. Dave Clark, Annette Litherland, Gonzalo Mata and Robert Burling-Claridge [5] explore space-based grassland monitoring by new technologies in New Zealand. Therefore, the process of protecting high plants by maintaining pastures should also be explained during the lesson.

RESULTS AND DISCUSSIONS

Below we will introduce learning objectives for the topic “Lycopodiophyta division” based on Bloom’s Taxonomy.

The content of teaching the division of Lycopodiophyta

Learning goals	Content of educational goals
Knowing	1. Learn about the division of Lycopodiophyta; 2. Determining the characteristics of the division; 3. Classification into classes; 4. Knowledge of procedures; 5. Separation of families.
Understanding	1. Understanding divisional signs; 2. Providing information about classes; 3. Morphological processing of patterns through samples; 4. Coming to a certain opinion and defending one's opinion on the characteristics of families and groups.
Application to practice	1. Modeling of characteristics specific to the division of Lycopodiophyta; 2. To distinguish representatives of the Lycopodiaceae family; 3. Retelling the rules, views and theories learned in connection with the module.
Analysis	1. Comparison of characteristics specific to the division of

	<p>Lycopodiophyta with other plants;</p> <p>2. Analysis of reproduction of Lycopodium clavatum</p> <p>3. To distinguish the similar and sharply different sides of the herbarium specimens of Lycopodium clavatum collected due to different age conditions;</p> <p>4. Analysis of the development cycle of Selaginella</p>
Synthesis	<p>1. Separation of herbariums of Lycopodium clavatum;</p> <p>2. Differentiate the life cycle of Selaginella;</p> <p>3. Processing procedures specific to the department of plants within families and categories;</p> <p>4. Synthesis of life cycles and biological characters</p>
Conclusion	<p>1. Evaluation of mastered subject materials;</p> <p>2. To give an opinion about the systematic sequence in the division of Lycopodiophyta</p> <p>4. To support the aspirations of students to acquire knowledge</p> <p>5. Taking into account the opinions expressed in relation to the training materials and denying the ideas encouraging wrong education</p>

Basic concepts: section, class, order, family, genus, species, reproduction, life cycle, description.

The aim of the work is to familiarize with the family, genus and species specific to the division of Lycopodiophyta.

Materials and equipment: Lecture text, textbooks, pictures, tables, herbariums, ruler, magnifier.

Theoretical material. These plants are the oldest plants, and they developed well on Earth at the end of the Paleozoic era. Currently, there are more than a thousand of their species.

Among the fossil species were large trees. In some plants, the underground organ is in the form of a typical rhizome, which contains metamorphosed leaves and additional roots.

There are microphylls, or small leaves in the Lycopodiaceae family; their stems are very developed

and covered with densely arranged small leaves, which include a bundle of water pipes, which does not have a leaf ring. Lycopodium sporophylls are unisporangial.

Plant roots and stems grow using apical meristem. Sporophylls are mainly located in spore spikes. Genital organs are in the form of antheridia and archegonia. In the antheridia, spermatozoa with two or more cells develop, and in the archegonium, an egg cell develops. Fertilization takes place in a watery environment.

This division is divided into two classes: Lycopodiopsida and Isoetopsida. Lycopodiopsida includes one order – Lycopodiales. The class of isoetopsids (Polushnikas) also includes 2 orders: selaginellas (Selaginellales) and isoetopsids (polushniks) (Isoetoles) [3].

Order of work

1. Identify each family and order by showing the external structure of the herbarium specimens and using information from the method guide.
2. Distinguish the characters of the species by means of drawings presented in herbariums and posters.
3. On the basis of herbarium and Internet information, schematically express the morphological characteristics of the species and draw conclusions about their life cycles.
4. Fill in the tables using theoretical materials.

Assignments

Task 1. Identify the characteristics of higher plants and complete the table.

Table 1

Plantae	Botanic characteristics
Clade Lycophytes	
Class Lycopodiopsida	
Order Lycopodiales	
Family Lycopodiaceae	

Task 2. Distinguish and describe the morphological characters of each species by showing the external structure of herbarium specimens and using a methodological guide.

Task 3. Complete the reproduction process of Selaginella in the diagram.

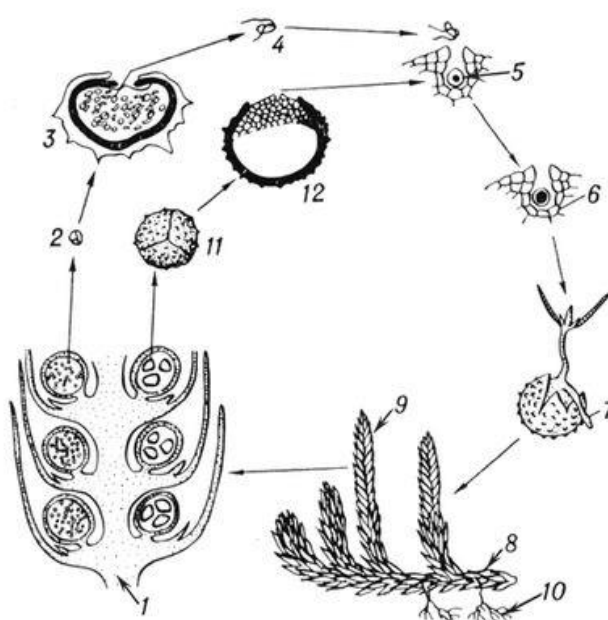


Figure 1. Scheme of the development cycle of Selaginella.

Answers: 1 – strobil; 2 – microspore; 3 – male gametophyte; 4 – sperm; 5 – egg cell; 6 – zygote; 7 – the beginning of the development of the saprophyte;
8 – mature sporophyte; 9 – strobil; 10 – metaspore; 11 – female gametophyte.

Figure 2. Describe this plant taxonomically



Task 4. Fill in the table using theoretical materials.

Table 2

Plantae	Characteristics
Lycopodiopsida class orders	
Izoetopsida class orders	
Genera of the classes	

Non-standard educational task

1. Biological dictation on the topic

This order includes the _____ family. A characteristic feature of this family is that its

representatives form two types: small or microspores and large or macrospores.

After germination of microspores, only paternal gametophytes that give antheridia appear, and maternal gametophytes that give archegonia develop from macrospores. The vegetative part of the paternal and maternal gametophytes is very _____. This family includes only one genus *Selaginella* (*Selaginella*), which has _____ species.

Selaginella is a low herbaceous plant (up to 0.5 m), often dichotomously branching. The branches are covered with small and densely arranged leaves; in some species, the size and shape of the leaves are different (it is called _____).

Answer: *Selaginella* (*Selaginellaceae*), reduced, about 600, anisophyllly

Questions on the topic:

1. What goals do we achieve by studying the division of Lycopodiophyta? What is their significance?
2. Are there any signs that connect the division of Lycopodiophyta with the division of Rhyniophyta?
3. Explain the range of distribution of *Selaginella* on earth.
4. Discuss the area of distribution of the *Lycopodium clavatum* on earth.

Evaluation criteria (in points)

Groups	A creative approach to work (0.5)	Completion of assigned tasks (0.3)	Activity (0.2)	Sum of points (1)
1				
2				
3				

CONCLUSION

The organization of laboratory topics in the program on the higher plants module of botany science on the basis of advanced pedagogical technologies and ensuring the increase of students' learning rate requires the creative approach of the science teacher today. By doing this, students will achieve a high score

on botany and significantly increase their knowledge on higher plants.

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