ACHIEVING LEARNING OUTCOMES IN TEACHING BOTANY

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Today, it is important to study systematics of botany and use innovative technologies to create knowledge and skills in students. However, the role of case technologies in the ability to use modern technologies from the point of view of science and effectively achieve educational results is incomparable.

Case studies provide real-world examples that demonstrate the value of technology products and services. There are several types of case studies that illuminate different insights: Success stories showcase how a company achieved a goal or solved a key problem using a particular solution. It is necessary to achieve the following learning outcomes when applying the case study in the science of plant systematics:

- ✓ Students will be able to comprehend classical techniques used in plant taxonomy
- ✓ Students discuss historical development of plant systematics
- ✓ Students explain the rules of nomenclature
- ✓ Students explain the code of nomenclature
- ✓ Students list up classical plant identification methods.
- ✓ Students arrange identification key.
- ✓ Students will be able to comprehend chemotaxonomy and its application methods in plants.
- ✓ Students explain the importance of chemotaxonomy.
- ✓ Students list the methods of chemotaxonomy
- ✓ Students perform an example application of chemotaxonomy in a laboratory.
- ✓ Students will be able to comprehend cytotaxonomy and its application methods.
- ✓ Students explain application methods of cytotaxonomy in plants
- ✓ Students perform representative cytotaxonomy application in a laboratory.
- ✓ Students will be able to explain phylogeny and quantitative classification methods.
- ✓ Students list up phylogenetic and quantitative classification methods.
- ✓ Students explain phenetic taxonomy and application areas.
- ✓ Students will be able to explain the methods of molecular plant taxonomy
- ✓ Students design a molecular systematic study.
- ✓ Students compare the techniques widely used in molecular systematic studies
- ✓ Students explain the methods of making a phylogenetic tree.
- ✓ Students discuss case studies based on molecular systematics [3].

We believe that it is also important to develop research-based interests in teaching biology. The section “Methods of Teaching in Biology” has a wide range of research interests including:

Methodology of Biology Education – research on effectiveness of psychological theories of learning in the field of biology education;
Teaching and Learning in Biology – research on teachers’ thinking, acting and strategies, investigation of students’ conceptions, conceptual change, classroom contexts and fundamental learner characteristics as problem solving, cognitive reasoning, attitudes, motivation, interests, self-concepts, reflection etc.
Instructional Design – research on standards, systematic science education reforms and professional development of biology teachers; design of curriculum for health and ecological education in school context; implementation, evaluation and social analysis of curriculum.

Section “Botany” includes:

- ✓ Plant biodiversity and ecology – phytocoenology, phyto-indication of anthropogenic pollution, monitoring and macrophyte-based assessment of ecological status of lakes and rivers;
- ✓ Medical and essential plants – biological active substances of plants, antioxidant properties;

Section “Methods of Teaching in Biology” includes:

- ✓ Health education in school environment;
- ✓ Environmental education in school context;
- ✓ Student-oriented strategies of biology education;
- ✓ Reflection in biology education [2].

Plant systematics is a multidimensional scientific discipline that describes names, classifies, and determines relationships among plants. Systematics provides a reference system for the whole of biology and therefore can be seen as both the most basic and the most wide-ranging area of biology. It is the most basic because organisms cannot be discussed or treated in a scientific way until some classification has been achieved to recognize them and give them names. Of the named species, it is estimated that less than 1% have been studied beyond the essentials of geographic location, habitat preference, and diagnostic morphology. Plant Taxonomy has progressed very quickly. Molecular biology is now very used to characterize different plant species and classify them. Despite these advances, there are profound perils in the molecular age of systematics: There is a tendency to favor phylogenetic reconstruction based on molecular data and marginalize research program focused on the study of organismal biology. These results in those

systematists have become scarce. In Morocco, the plants are a major subject of study of university education in the life sciences. There are indeed lessons in botany and flora even though the plant is no longer a scientific concept but only represents a daily concept in terms of historical problems. Thus, a first-year module plant biology aims to gain the students the necessary scientific knowledge on the morphological and anatomical diversity of the major groups of the plants and the main basic concepts of Botany and sensitize them with multiple interests aroused by the study of plant. In second year, the Floristic module aims to give students the general bases of the botanical classification, the goals of their use and the various methods of biosystematics. In the third year, another module aims to inculcate students the physiological basis of growth and development of plants [1].

It is necessary to achieve a creative approach for students to acquire knowledge from subjects. Their creativity is enhanced by doing case studies during the course. They are able to think and understand that each species has its own role in nature. So, it is necessary to generalize and enlarge of ESD in Uzbekistan [4].

In conclusion, it can be said that problem setting, solutions and performance indicators in plant systematics and biological sciences in general are achieved with the help of technologies and methods used in the teaching process.

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