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STUDY OF SOME LEARNING DIFFICULTIES IN PLANT CLASSIFICATION AMONG UNIVERSITY STUDENTS

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Abstract: The plants constitute a major subject of Biology education in university. There are indeed lessons of botany, even though the plant is no longer a scientific concept but only represents a daily concept in terms of historical problems. This study aims to identify some difficulties related to teaching of plant classification and evaluate university students knowledge in plant biology and their ability to mobilize this knowledge to classify plants. We used the questionnaire and semi-structured interviews as an investigative tool. Preliminary results show that students find significant difficulties in identifying species by using key determination.

Keywords: Botanical classification, learning difficulties, university students

Introduction

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 (Daly et al. 2001 ; Wheeler & Valdecasas 2007). 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. This results in that systematists have become scarce (Dunn 2003).

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, there is a first-year module plant biology that 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.

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To the best of my knowledge, almost no reports in Morocco have examined students' knowledge and understanding of Plant classification. Hence the importance of this research , which aims to identify some difficulties related to teaching of plant classification and evaluate university students knowledge in plant biology and their ability to mobilize this knowledge to classify plants.

Methods

This study is mainly qualitative, our methodology was mixed. We used a questionnaire and interview. this qualitative analytical methods were supplemented with statistical analysis.

Students Sample

All students surveyed in the study were enrolled in a graduate biology program at the University, The sample is composed of 76 Graduate Students (baccalaureate plus 3 years of study) and 20 Master' students (baccalaureate plus 4 or 5 years).

The Questionnaire

We composed an questionnaire to acquire information on several key issues: (a) the students' understanding of plants biology, (b) the students' understanding of how to classify a plant. The questionnaire includes 39 questionnaires related to students' understanding of plants Biology and Floristics and others regarding their opinions on the floristics' course and lab.

The Interview

Fifteen students participated in interviews (9 girls and 6 boys) which was held in two phases. On the first interview, the students identified 30 species of plants from photographic slides. The names for plant categories that the students used in that interview formed the basis for the second interview, in which the student listed all the names for members of each category that she/he could think of.

The names for categories of plants were elicited through questions such as, "What kind of this plant is ? Category membership was further explored through questions such as, "Point out all these plants," "Are these two plants the same kind of plants?" Criteria for category membership was examined through questions such as, "How can you tell that these two plants are similars?" "How can you tell these two plants are different?" Next the student was given a stack of photographs of 20 species of plants. The student was asked to sort the photographs into groups. Then the researcher asked the following questions for each group: "What name would you give this group?" "Explain what the members of this group have in common." "How is this group different from that group?"

Results

More than one out of five students think that all plants are identical, they are green and they come from seeds. But more than two students have problems in topics related to plant reproduction, and they think that inbreeding increases the biodiversity as it reduces and standardises the populations of a species. For these students, inbreeding is the major mode of reproduction, it is because they link this to the immobility of plants (plants can not move, so they reproduce by self-fertilization) (Table 1).

All aspects and modes of reproduction in plants were studied along the academic study, but students do not link this learning with the previous ones and do not mobilize them in a different context from that of teaching . Compartmentalization of programs is one of the major causes of learning problems among students.

Table 1 : Students' knowledge of botany (%)

		False (%)	Correct (%)
77	The male and female branches are always separated?	80,4	19,6
82	All male and female plants are identical	79,2	20,8
83	All plants are green	86,5	13,5

84	Male and female gametes are always different	48,3	51,7
85	All plants came from seeds	75,0	25,0
86	All plants are diploid	84,3	15,7
87	The gametophyte phase reduces in the development cycle by going to the angiosperms	50,0	50,0
93	Most of the plants are hermaphroditic and autogamous	50,0	50,0
96	Autogamy can promote plant diversity?	58,1	41,9
99	Higher plants are more important than other plants of small sizes	57,1	42,9
101	cryptogams plants include: algae, fungi, and also bryophytes, lichens and Pteridophytes	50,0	50,0

More than one student out of four think that the plants' classification is reduced to the use of an identification key based on observable morphological characters (54%) without making a link with the purpose of classification (23%, question 90). One student out of two states that classification of living beings do not consider in the same way the current species and fossil ones (43% Q97) (Table 2).

Four out of ten students affirms that the tracheophytes are not vascularized plants, this is incorrect because tracheophytes are characterised by their developed highly vascular systems wich facilitate the transportation of water and nutrients to all parts of the plant.

Students have significant difficulties in understanding of the major concepts of botany who are interested in the morphological and physiological characteristics of plants. Botany is the basis of plant classification because most of the criteria used to classify plants are based on a good understanding of botany.

Table 2 : Students' understanding of plants classification (%)

		False (%)	Correct (%)
72	There is a relationship between plant species?	16,4	83,6
73	Some species have fossil ancestors?	13,2	86,8
74	A taxon includes individuals who resemble one another	24,5	75,5
75	The classification allows to conserve biodiversity?	25,9	74,1
88	Tracheids are less evolved than the phloem and xylem	28,6	71,4
89	Plant Taxonomy is to determine "which is closer than the other	22,4	77,6
90	Plant Taxonomy is to determine "who is the ancestor of the other"	23,3	76,7
91	Taxonomy is a use of a determination key to sort species	24,5	75,5
92	The classification serves to understand the plants biodiversity	25,0	75,0
94	The classification of plants serves to understand the unity of plants	35,6	64,4
97	the classification of living beings considers in the same way the current species and fossil ones	42,9	57,1
102	The Tracheophytes are vascularized plants	38,9	61,1
103	Shape of the leaves helps to distinguish angiosperms	25,0	75,0
104	To identify a species, just use an identification key which is based on observable characteristics	45,7	54,3

The criteria used in interview are the anatomical characters (anatomy of leaves, stems , roots) only.

The other characters as the cytological, the physiological characteristics (different modes of photosynthesis and metabolism) or the Ecological ones are not cited by students when we asked them to classify and differentiate some plants species.

The students have also difficulties in using floral formulae to differentiate between plants that have the same morphology.

This confirms that fragmentation in science arises when an attempt is made to impose divisions in an area of knowledge in an arbitrary fashion, without regard to a wider context (Jorge 2006).

Conclusion

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 (Jorge 2006).

The results of this study show that students do not assimilate well the basic concepts of the floristic and they do not mobilize their knowledge to classify plants.

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 (Daly et al. 2001). There is a tendency to favor phylogenetic reconstruction based on molecular data and marginalize research program focused on the study of organismal biology. This results in that systematists have become scarce.

The science of plants' systematic is a vital discipline that underpins the conservation of the Earth's biodiversity.

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