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## THE USE OF "KEYS" IN TEACHING BIOLOGICAL CLASSIFICATION

H. E. JAQUES

Patagonia would doubtlessly prove thrilling to the biologist *if he were only there*. When far-distant lands are put out of reach, what can be better than to emphasize the biology of our own immediate locality and that is much more practical for our students.

Two fields of interest are brought to our high school and college classes. Some of our students desire a knowledge of biology to use in a professional way. Very often a much larger percentage of the enrollment will never enter any purely biological vocation, but all may acquire an interest in the common plants and animals that will enrich their entire lives.

Biology is the study of living things. It assumes many phases, of course, but all of its numerous subsiences are dependent upon the correct identification of the plants or animals being studied. This matter of recognizing the plants and animals would then seem to be highly important. Fortunately the study may be made very interesting. Instruction in plant and animal identification should have a prominent place early in a beginning course in biology, botany, or zoology. With such training the student will be in a much better position to understand the other phases of his course.

"Keys" offer the best means of training student classification. By way of illustrating some of the possibilities, let's take a beginning class in botany and teach them to use Dr. Conard's splendid "Plants of Iowa." Each student should have a book in hand. We have brought in some flower models or plant charts. This seems to be better than actual flowers to begin with, since these are large enough that all may see, and the class may be carried along together. The teacher is sure that all are looking at the same thing. Some parts of the flower being studied are pointed out and named, — petals, sepals, stamens, bracts, etc. — and the flower is looked over and the arrangements of these parts noted. The mechanical construction of the key is discussed. Then we start in running our plant of the chart or model through the key. Different students are called upon to designate the succeeding steps until the family, or possibly the species, is reached. Then the characters that were employed in arriving at the family name are recalled or picked

from the key by running back through it. This visualizes the general characters for that family. In like manner, generic and species characters may be called for and discussed. After two or three plants have been run through the key as a class exercise, we will turn to an easy one and ask each student to work it out on his own. Presently we will ask how many have arrived at a family. The correct family name will be brought out and the students permitted to ask about difficult places in the key. They will then be instructed to determine the genus and, later, the species. After the students understand the mechanics of the work, we will change to the use of actual flower specimens, brought to the class or laboratory, or go on field trips where the plants may be studied in their natural settings.

The conviction that a knowledge of plant and animal identification and an accurate mental picture of the grouping and logical relationship of living things is essential to the most intelligent work in other fields of biology led to the production of "Living Things — How to Know Them." The reception given it seems to indicate that many biologists share the notion that some such identification work is highly desirable for beginners. An assorted collection of plant and animal specimens is put out in the laboratory. The specimens bear numbers but no names. Each student with a copy of "Living Things" in hand selects a specimen in which he is interested and determines its phylum, class, and order by use of the key. The purpose is to see how many different orders can be worked out during the time allotted. A list of the plants and animals thus determined with the phylum, class, and order names in each case is turned in by the student at the end of the period, for grading.

When an animal or plant is classified to Order the student checks the order name in the phylogenetic list at the back of the book. It is felt that thus finding its place in the list and checking it helps the student to visualize its relationship to other living things. The phylogenetic list serves the systematic biologist much as a map serves the student of geography. As the students work from time to time at this determination each one is encouraged to finish as many different orders as possible and to see that they fall in the maximum number of phyla and classes.

The work may be carried out of doors and a collection of plants and animals made or a survey of the school grounds, a city block, or a garden taken to determine how many orders of plants and animals live there.

The student of systematic entomology who can readily and accurately place a good percentage of the insects he finds, to order and family has an excellent foundation for his study. "How to Know The Insects" is used in our general zoology class for teaching classification, and with our entomology students. Considerable key work is done. Insect collections are made and the specimens determined to families with minimum requirements for orders and families. The check list of orders and families is marked to show the student's progress. Frequent quizzes are made by giving the student a group of numbered specimens and asking him to write the order and family name of each one he can recognize. This same plan works well with any phase of plant or animal study. It gives the student an incentive to be accurate in his determination and to be interested in remembering the species determined. It also helps him to organize his information.

Another quiz scheme that has been found valuable is to require each student to write down in their order the steps he has taken in the key in classification of a plant or animal. The characters may be included in this written list but ordinarily only the successive numbers are recorded, thus: 1b, 17b, 18b, 19a, 20b, etc. except that as division heads such as class, order, family, etc. are reached they are written in.

It has been attempted to review some of the known methods of using identification keys. Any educational scheme needs to be adjusted to the temperament of the teacher and students. The efficient teacher will find his own special ways of presenting a subject and they will be the best for him.

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