
ATTACHMENT 6—AN INTRODUCTION TO BINOMIAL KEYS

To introduce students to the concept of binomial keys, we first use objects with which most are very familiar—sport balls. Beginning with a collection of balls—golf ball, bowling ball, softball, baseball, basketball, football, volleyball, soccer ball—we introduce the idea that things can be classified or categorized by whether or not they have a particular attribute.

For example (see Figure 1), you can subdivide the group of balls by whether they are solid or not. Continuing down the diagram you can divide the solid balls into two groups—those having three finger holes and those that don't. There is only one ball with three holes—the bowling ball. You have clearly identified this object. Looking at the balls without three holes, you can divide them into balls with or without seams. One ball, the golf ball, does not have seams. The two balls that have seams can be categorized by size. Only one has a diameter of 3 inches—the baseball. The other, which is larger than 3 inches in diameter, is the softball.

We can then do the same activity with the side of the diagram that deals with balls that are not solid. We continue down that side until we have identified only one ball that meets the criteria named. We have used criteria to clearly identify each individual ball type from all the others.

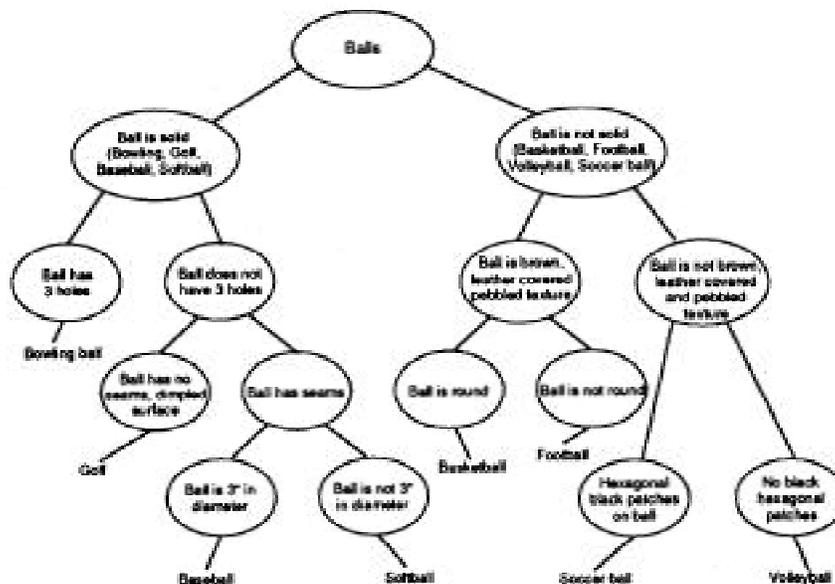


Figure 1.



Most dichotomous keys are not done in diagram form (uses too much space) and they often list two contrasting attributes of objects instead of using the “has or doesn’t have” statements. Although the intent is the same (to differentiate objects), these keys can become confusing. Now that students understand the basic premise behind a key, they are given practice working with the balls again, but this time using the more common technique (See Figure D).

In step 1, balls are divided according to whether they are solid or hollow. If solid, the key user goes to step 2a where the bowling ball is identified because it has three holes. For the other solid balls you continue on to step 3 where the golf ball is identified because it is the only ball without seams (and a surface covered by dimples). The remaining two balls (softball and baseball) are identified in step 4 by their diameters).

Going back to step 1, if the balls are hollow, the user immediately goes to step 5. In step 5 the football and basketball are separated from the soccer ball and volleyball by color (brown) and surface type (pebbled surface). In step 6 the basketball and football are distinguished from each other by shape. Finally, in step 7 the volleyball and soccer ball are identified using their traditional appearances (white for the volleyball and hexagonal black patches for the soccer ball).

Having developed an understanding of the basic concept behind a key (using the diagram in Figure 1) and becoming familiar with the traditional way in which keys are written (Figure 2), the students are now ready to try using the insect key to identify aquatic organisms at the stream site. It is critical that a stream ecologist, having a strong background in aquatic invertebrates, be present to assist students as they try their hand at this identification.

| | |
|---|-------------|
| 1 a - Ball solid | 2 |
| 1b - Ball hollow | 5 |
| 2a - Ball with three holes | Bowling |
| 2b - Ball without holes | 3 |
| 3a - Ball with seams | 4 |
| 3b - Ball without seams, surface covered with small dimples | Golf |
| 4a - Ball about 3 inches in diameter | Baseball |
| 4b - Ball larger than 3 inches in diameter | Softball |
| 5a - Ball usually brown, leather covered, pebbled | 6 |
| 5b - Ball white or white and black | 7 |
| 6a - Ball round | Basketball |
| 6b - Ball oblong, pointed at ends | Football |
| 7a - Ball solid white | Volleyball |
| 7b - Ball usually with hexagonal black patches | Soccer ball |

Figure 2. Key to Sport Balls

