Jelly Belly\textsuperscript{\textregistered} Jelly Beans & Evolutionary Principles in the Classroom: Appealing to the Students’ Stomachs

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Presentations in the classroom usually focus on only two senses: sight and sound. Science educators have expanded the emphasis on these traditional methods by including laboratory or field environments in their educational portfolios. In these latter locations, teaching is more effective and learning is made relevant by hands-on experiences. Often this realm incorporates a third sense (touch, e.g. slimy worms) or even a fourth (smell, e.g. marsh gas) to promote learning. Unfortunately our fifth sense, taste, is rarely employed as a learning tool in the biological sciences.

Taste can be used as an effective learning tool in the classroom, particularly when illustrating the ecological significance of predation. Students make great predators and can be counted upon to eat at almost any time. Taste can be incorporated with sight and sound to enhance the learning experience. Students clearly have taste preferences, and I have used this to my advantage when illustrating any number of ecological concepts, particularly when food, foraging, predator or prey species are discussed.

The prey species used in my classroom is the Jelly Belly\textsuperscript{\textregistered} jelly bean. Jelly Bellies\textsuperscript{\textregistered} not only come in different colors, they have a wide range of distinctive and unique flavors (40 in all) that can be counted upon to entice or discourage predatory students. These two features can be used to illustrate specific biological adaptations whenever taste or color (e.g. mimicry, camouflage) choices are made by predators or prey. Both features can be combined to extend the concept to a more complex interaction. Among those flavors I have used successfully are licorice, toasted marshmallow, margarita, root beer, orange juice, tangerine, cantaloupe, jalapeno, lemon, blueberry and sizzling cinnamon. The “best” flavors are those that some but not all students prefer. A complete listing of Jelly Belly\textsuperscript{\textregistered} jelly beans can be found at sales locations or by contacting the company on the Internet (http://www.jellybelly.com).

Two specific examples of how Jelly Bellies\textsuperscript{\textregistered} can be used in the classroom are listed below. I have also suggested some other less detailed examples of applications to other teaching concepts. You can find a more complete description of the ecological principles discussed in this presentation by referring to Smith (1995), Begon et al. (1996) or Krohne (1997).

\textbf{Example #1}

\textbf{Concept}

To illustrate the three fundamental modes of natural selection.

\textbf{Objectives}

Identify how directional, disruptive and stabilizing selection occurs in phenotypes using predation as the selection pressure.

\textbf{Class Size}

I usually limit distribution of jelly beans to fewer than six students in any given class. Although only a limited number of students directly participate, anticipation is great among all students in the class. In addition, students chosen for the testing usually share with those around them, expanding the direct student involvement. I have successfully used this technique in classes of 70 students with no apparent loss of attention by those not directly involved.

\textbf{Materials & Methods}

1. The procedure requires three bags (minimum) of Jelly Belly\textsuperscript{\textregistered} jelly beans with an assortment of colors, one bag for each of three selection types (directional, stabilizing and disruptive). I typically use six colors from light (yellow) to dark (black) as shown below, but many combinations work equally as well. I always include licorice as most students either really like or dislike the flavor and it is at the extreme end of the color range. The number of beans used is a compromise between minimizing the cost of the jelly beans and obtaining a “normal” or “bell-shaped” distribution of color frequencies. Colors represent the array of phenotypes found within a population of a single prey species.

\begin{tabular}{|c|c|}
\hline
Color/Flavor & Number of Beans \\
\hline
Yellow/lemon & 5 \\
Green/margarita & 14 \\
Orange/cantaloupe & 31 \\
Red/very cherry & 28 \\
Blue/blueberry & 16 \\
Black/licorice & 6 \\
Total per bag & 100 \\
\hline
\end{tabular}

2. At the beginning of class, I solicit volunteers to eat the Jelly Bellies\textsuperscript{\textregistered}. Depending on the selection process, I may or may not choose those who like or dislike certain flavors, e.g. licorice. (If students don’t like licorice and you want them to eat these beans, they may not follow your instructions.) Included with each bag of jelly beans is an instruction sheet that students must follow. I do not tell the rest of the class what the instructions say. Examples of the instructions for each of the three selection types are shown