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Molecular Puzzles

Overview of Product

After an introduction to inquiry during the first week of my biology class, I move into the all-important concept of biochemistry. As I have grown as a teacher over the past 13 years, I have come to the conclusion that biology is essentially chemistry. I have found myself saying almost every day, "You remember from biochemistry that..." (you can fill in the blank). However, I have found biochemistry to be, at times, one of the more difficult concepts for my students to grasp, and to my horror, some teachers do not even address it because "it is too hard for the students." I think it comes down to two major obstacles. One, the vocabulary associated with biochemistry; and second, the fact that biochemistry occurs on such a scale that it is an abstract concept to students.

Recently, I had the chance to use a product that helped tackle both the vocabulary and the abstract nature of biochemistry. The Molecular Puzzles kit by Cell Zone is a kit that addresses both of these issues. The kit consists of puzzle pieces that help students learn about the four types of biological macromolecules, with a focus on dehydration synthesis and hydrolysis. The Molecular Puzzles kit is designed as a Universal Design for Learning (UDL) system (UDL is an approach to learning that reaches the most students without watering down the content; to learn more, visit <http://www.cellzone.org>).

Learning Goals & Standards

The main goal of the Molecular Puzzles kit is for students to learn about biological molecules in an inquiry-based approach. The National Science Standards for Life Science in High School and Middle School are addressed by the activities found within the guidebook. Depending on what the goal of your course is, this kit can be

modified for use in the middle school classroom up to AP Biology or Introductory Biology courses. I used the kit with my Advanced Biology course and with my AP Biology course as a review. Each activity begins with a general goal that is written in a way that can be modified to meet your state or national standard. For example, the Water & Molecules section begins with the goal "Become familiar with water molecules." With simplified goals, this kit can be justified at any level with any student.

Materials & Preparation

Each kit comes with enough pieces to make 12 glucose monomers, 12 amino acids, 12 deoxyribonucleotides, 12 ribonucleotides, 12 triglycerides, or 12 phospholipids. The kit comes in a tote bag and includes an instructor guidebook with student activity sheets. The carbohydrate pieces are green, protein pieces are blue, nucleic acid pieces are purple, and lipid pieces are yellow. Oxygen atoms (red) and hydrogen atoms (white) attach to the other pieces and allow for students to carry out dehydration synthesis and hydrolysis reactions.

I was able to have the kits ready to go in under 10 minutes. Besides running off the worksheet for students to use, the kit is very teacher- and student-friendly. Finally, the puzzle pieces are all dishwasher safe as well, so many students can use them for a long time.

Instruction

As mentioned before, the kit is written for an inquiry approach. The students are given only certain parts of the puzzle and follow the simple instructions provided. The key to success is for the students and the instructor to follow the four basic rules that are laid out in the guidebook. I placed the rules on the board so that the students did not have to flip back and forth. When I do this next year, I plan on typing out and

laminating the rules on a small card and placing it in the bag.

As many of us know, the terms "dehydration synthesis" and "hydrolysis" can be confusing for students. I had students model the process with the pieces as we went over the terms, and this reinforced their meaning. I strongly encourage doing this first, as these two terms are key to understanding. Along these lines, the guidebook begins with the formation of water, which is also central to the kit.

A key aspect that I found very helpful is that the puzzle pieces snap together in such a way that students cannot make an incorrect molecule. Students will try to force them, so be sure to mention this before you begin. However, I broke the most important rule in using the kit – I mixed up some of the colors. Do not do this, just follow the four rules and it will save you time and unnecessary confusion.

Summary

Those of us who teach biochemistry and may have used the ball-and-stick models or even the marshmallow-and-toothpick models, this kit by Cell Zone is a great alternative for the price. I used the kit for the first time this year and found that my students learned much more than they had in the past. Even more importantly, they enjoyed the process and were more engaged.

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