Do-It-Yourself DNA Discovery Kit

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TEACHER INTRODUCTION

This can be used in Biology / Life Science grades 6-12

Something Different: This DNA manipulative kit allows students to ultimately translate a DNA code-message by synthesizing a "protein" (amino acid sequence) in **readable in English**, and encourages students to create and decipher new messages written in DNA language. Kit consists of 6 parts or stages: 1) Nucleotide Kit (in which simplified symbolic shapes are used to learn the basic structure of RNA and DNA nucleotides); 2) Replication Kit; 3) Protein Synthesis Kit; 4) "Say It With DNA" (or Protein Synthesis Worksheet") for practice on longer messages; 5) DNA Message Decoder; and 6) DNA Message Maker, both now part of the "Say It With DNA" kit (on the ENSI website).

I created this series of kits in the early 1960s, and have used it every year in my Biology classes, with minor modifications added along the way, with great success. No commercial kit I've tried does the job as effectively.

Included in the kits are simplified shapes representing the nucleotides and their components. Note that **shapes** play a key role, as they do in the real molecules. Notice that A & T are angular letters, so simple angular interfaces are used for those bases. C & G are curved letters, so curved interfaces are used. T & C are smaller bases than A & G, and these size differences are clearly shown. The nucleotide sequence in the Model of a DNA Molecule will translate ultimately into an amino acid sequence whose first initials will spell out a 3-letter English word: PAL (don't tell your students; let them discover it).

SUGGESTIONS: A large-scale **demo set**, with magnets, would be most appropriate for use on magnetic boards. I have done this, as well as overhead transparency pieces, though the latter is a little awkward to use in that small space. A PowerPoint version demonstrating the kits would be very useful. I can also visualize an interactive computer program that could replace (or illustrate) all the kits. It would involve the use of click-and-drag-and-drop of the various "pieces", moving them about, much as we do in the kits. This would be even better for demos, as the linking of RNA nucleotides into the m-RNA strand can be facilitated more easily. However, the hands-on kits should definitely be retained for students to actually, and individually, DO the work.

NOTICE: To keep the main concepts of structure and function (and the "Central Dogma") as clear as possible, certain simplifications have been made. For example, the 5'-3' structure of the DNA "ladder" (page 2.2) is not used here. If you would like to try it, I could send you a version that does use that. During Protein Synthesis, the Messenger RNA strand "leaves" the nucleus and is read directly by a ribosome, much as in bacteria, not eukaryotes (where there are long "intron" intervals between functional gene segments that must be cut out so the remaining "exons" can be spliced together to make the functional mRNA.) Furthermore, the mRNA does not just lay out on a ribosome surface to be "read." In reality it passes between the two ribosomal sub-units where it is "read" much like a video or audio tape is "read" by a tape player. You may also notice that the Transfer RNA molecules don't have the typical tRNA shape, and the codon triplet sequence recognition mechanism is not exactly as portrayed here. Depending on the level of your course and concepts to be learned, use your discretion about revealing these details. In fact, after students have finished the kit, ask them if they noticed any discrepancies between the kit and what they learned in class (or the text).

I have sample exams if you are interested. I'd be happy to share. Just convince me that you are a teacher when you request this.

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