Unit
Genetics and Evolution

Title
DNA Jewelry Project

Summary
Students create DNA models from beads and wire that may be used as earrings, pendants, Christmas ornaments, and/or key chain pulls. This project is simple enough that a good substitute could lead the students through it since the content should be taught beforehand. More importantly, this is just one of many possible 3D DNA models you could have your students build. Be creative! Use gumdrops, Styrofoam, marshmallows, Legos, grapes, wood, aluminum cans, etc. Better yet, have your students design a model independently.

Objectives
Reinforce student understanding of the general structure of DNA and base pairing rules.

Vocabulary
DNA
Deoxyribose
Phosphate
Nucleic acid
Adenine
Thymine
Cytosine
Guanine
Base pairs
Nucleotide

Time
45-50 minutes

Grouping
Individual

Materials
Each student needs:

- 20 alphabet beads (6-7 mm) with the letters A, C, G, and/or T. Available for very reasonable prices ($2.00 for a bag of 100 beads) from Enterprise Art http://www.enterpriseart.com Item #1299011 (A), #1299013 (C), #1299013 (G), #1299030 (T)
- 40 colored beads (6-7 mm) to represent phosphates. See Enterprise Art ($2.19 for a bag of 1000) Item #100420 (red).

- 40 colored beans (6-7 mm) to represent sugars. See Enterprise Art ($2.19 for a bag of 1000) Item #100463 (turquoise).
- 20-30 seed beads in assorted colors to represent hydrogen bonds. See Enterprise Art ($1.99 for 75 grams of assorted seed beads) Item #144117.
- 40 cm of beading wire (26-28 gauge). See Enterprise Art ($2.54 per spool) Item #430602 (silver).
- Optional: earring hooks, Christmas ornament wires, wire loops for pendants, key rings, etc. See Enterprise Art ($2.54 for 48 fishhook earring hooks) Item #144202 (silver).

Groups of 4-6 students need
- Small condiment cups and trays on which to organize and set out materials.
- Wire cutters. (Do not use scissors! They will be ruined.)

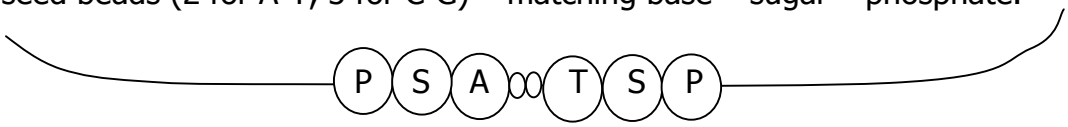
Setting
Classroom

Teacher Background
See Teacher Background in Paper DNA Models Lesson.

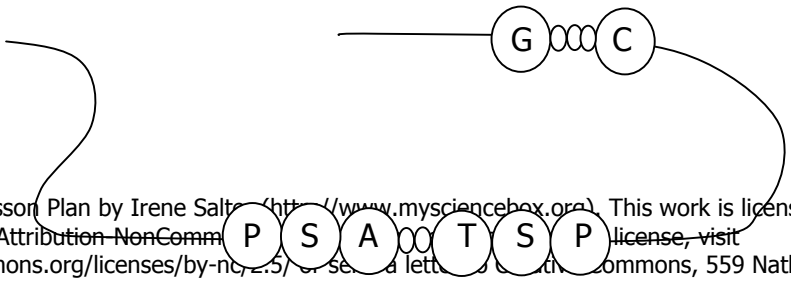
Student Prerequisites
Good understanding of DNA structure. See Paper DNA Models Lesson.

Getting Ready
1. Order beads (they take approximately 2 weeks to arrive from Enterprise Art)
2. Organize beads so that each tray contains enough materials for each group of 4-6 students. You may want to precut the wire as well to avoid the delay of passing the spools of wire around the room.
3. Optional: write the step by step guide onto the board or photo copy the instructions for each group of students.

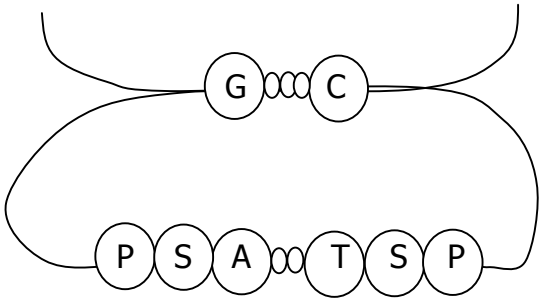
Instructions
1. String the following onto your wire: phosphate – sugar – base – correct number of seed beads (2 for A-T, 3 for C-G) – matching base – sugar – phosphate.



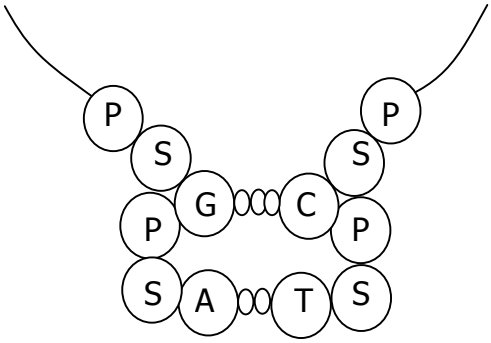
2. Onto one end, add: a base – correct number of seed beads (2 for A-T, 3 for C-G) – matching base. Do not push these beads down to meet the others.



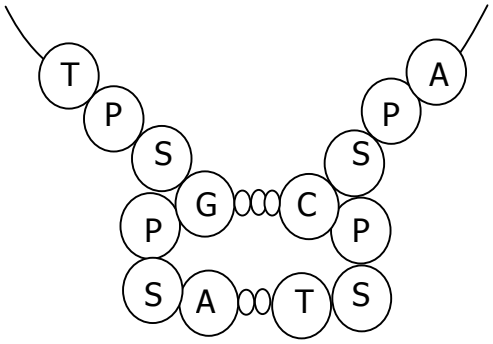
3. Feed the free end through the beads you just added.



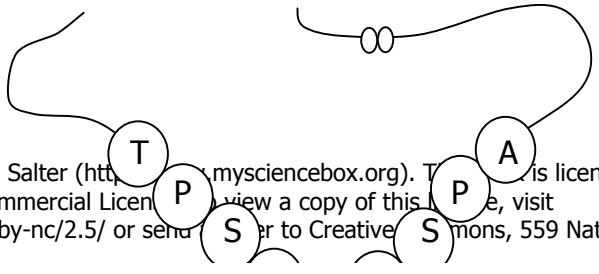
4. Pull the wire ends tight to form a loop. Then add to both free ends: sugar – phosphate. These may be pushed down to meet the others.



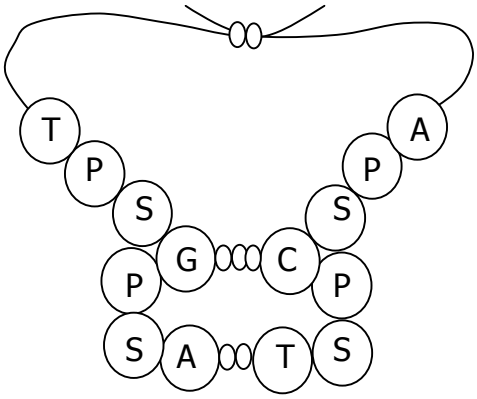
5. Repeat steps 2-4 until you have added as many rungs to your DNA ladder as you want.
6. To make the very last rung on your DNA and to tie it off, add one base to a free end and add its matching base to the other free end. These may be pushed down to meet the others.



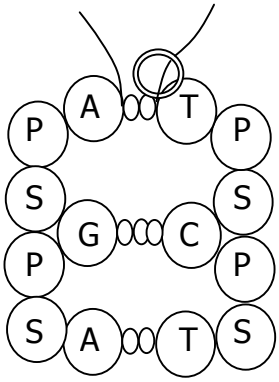
7. Onto one end, add the correct number of seed beads (2 for A-T, 3 for C-G). Do not push these beads down to meet the others.



8. Feed the free end through the beads you just added.



9. Pull the wire ends tight to form a loop. If you wish to add an earring hook, loop, key ring, Christmas ornament wire, or other doo dad, add it to one free end.



10. Twist the wire ends together tightly. Cut the wire off 3-4 mm from the base of the twist.
11. Finally, add a slight counter-clockwise twist to the entire DNA molecule to form a double helix. You have now made lovely DNA jewelry!

Sources

This activity was adapted from a DNA earring design by Karen Kalamuck of the Exploratorium Teacher Institute and from the "Modeling DNA, the Code of Life" activity by the RAFT Education Department. I recently discovered another write up for this activity by Catherine Ross (http://www.accessexcellence.org/AE/AEC/AEF/1995/ross_jewelry.html).

Standards

Grade 7

Genetics

2. A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences. As a basis for understanding this concept:

e. Students know DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell.

Grades 9-12

Genetics

5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:

a. Students know the general structures and functions of DNA, RNA, and protein. Students know how to apply base-pairing rules to explain precise copying of DNA during semiconservative replication and transcription of information from DNA into mRNA.