

Teacher Guide: A Recipe for Fish Traits

ACTIVITY OVERVIEW

Abstract:

Students create a “DNA recipe” for a fish by randomly selecting strips of paper that represent DNA. They then decode the DNA recipe to reveal the physical traits of their fish and create a final drawing of the organism. Students learn that differences in the DNA recipe lead to different traits by comparing their DNA recipes and fish drawings with the rest of the class to note similarities and differences.

Key Concepts:

DNA is similar to a “recipe” for traits in all organisms; DNA is made of small units, differences in the sequence of these small units lead to differences in traits.

Materials:

Student hand-outs, drawing paper, crayons or colored pencils, paperclips or tape, four different colors of paper, envelopes

Prior Knowledge Needed:

Physical traits are observable characteristics that make individuals unique.

Appropriate For:

Grades: 4 - 7

Prep Time:

30 minutes

Class Time:

45 minutes

A. Learning Objectives

- Students will understand that genetic traits are the heritable characteristics of an organism.
- Students will learn that DNA is a set of instructions, similar to a recipe that specifies the traits of an organism.
- Students will learn that the DNA “recipe” is made of smaller sub-units.
- Students will easily visualize how differences in DNA result in the inheritance of different traits.
- Students will observe that each organism is a unique combination of traits.

B. Background Information

Physical traits are observable characteristics. An organism’s traits are determined by that organism’s DNA. DNA is made of smaller units. Differences in the sequence of these smaller units are what create differences in traits.

The DNA molecule contains a sequence of four chemical bases, each represented by the first letter of its name: Guanine (G), Adenine (A), Thymine (T) and Cytosine (C). These bases, G, A, T, C are commonly referred to as the “DNA alphabet.” This DNA alphabet encodes a detailed set of instructions for building an organism’s physical traits. The DNA instructions are divided into segments called genes. Differences in the DNA sequence of each gene are what lead to different variations of any given trait. In this activity a gene is represented by a “DNA strip” and the chemical bases are represented by symbols.

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C. Teaching Strategies

1. Timeline

- One day before activity:
 - Create envelopes containing colored “Fish DNA” from which students will randomly choose DNA strips. (see *Materials Preparation Guide*)
 - Make copies of student pages S-1 through S-3.
 - Gather drawing supplies and tape or paperclips.
- Day of activity:
 - Distribute the following materials to each student, or group of students:
 - Student Pages S-1 - S-3
 - Tape or paperclips
 - Envelopes containing “Fish DNA” (See *Materials Preparation Guide*)
 - Drawing supplies
 - Carry out the activity as described on student page S-1.

2. Classroom Implementation

- Begin class by reviewing the following:
 - Traits are observable physical characteristics.
 - Though we may share some of the same traits with others, the overall combination of our traits makes us unique. This is true for all organisms.
 - A chemical called DNA determines our traits.
- Read the beginning paragraph of *A Recipe for Fish Traits* (page S-1) as a class.
- Have students work individually or in pairs to complete the activity (pages S-1-S-3).

Note: You might need to remind students to leave the DNA strips they choose out of the envelope and tape or paperclip them together in order. The resulting long strip will be their DNA recipe.
- Once students have completed the activity, have them post their drawings on the wall along with the DNA recipe for their fish.

3. Assessment Suggestions

- Ask the students to explain why each of them ended up with a different drawing. You might ask them to use the following words: DNA, differences, sub-units (or genes), traits.

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MATERIALS

A. Detailed Materials List

- Student handouts (S-1 through S-3)
- Drawing supplies such as: blank paper, colored pencils, crayons, markers
- Tape or paper clips
- Colored paper (four different colors) to make “Fish DNA” strips
- Envelopes to contain colored “Fish DNA” strips

B. Materials Preparation Guide

To prepare “Fish DNA” envelopes for a class of 28:

1. Make eight copies each of *DNA Strips A, B, C, and D* (see *Teacher References*) on colored paper choosing one color for each type of DNA Strip.

Ex.	<i>DNA Strips A</i> (page 5)	8 copies on Blue
	<i>DNA Strips B</i> (page 6)	8 copies on Green
	<i>DNA Strips C</i> (page 7)	8 copies on Yellow
	<i>DNA Strips D</i> (page 8)	8 copies on Red

2. Cut out the DNA strips on each page (a paper-cutter works well)
3. Place two DNA strips of each color in an envelope. The envelope should contain eight DNA strips total (four different colors).
4. Repeat step three until you have assembled 28 “Fish DNA” envelopes.

Note: This is the minimum number of DNA strips per envelope that you need to carry out the activity. Adding more DNA strips of each color increases the variety of possibilities for each trait.

STANDARDS

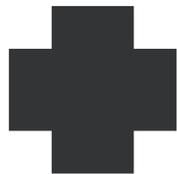
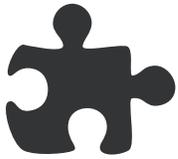
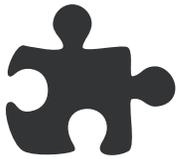
A. California State Science Content Standards

Life Sciences:

Grade 7: 2b,2c,2d,2e,2f

Grade 9-12: 3a,3c

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DNA Strips A

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DNA Strips B

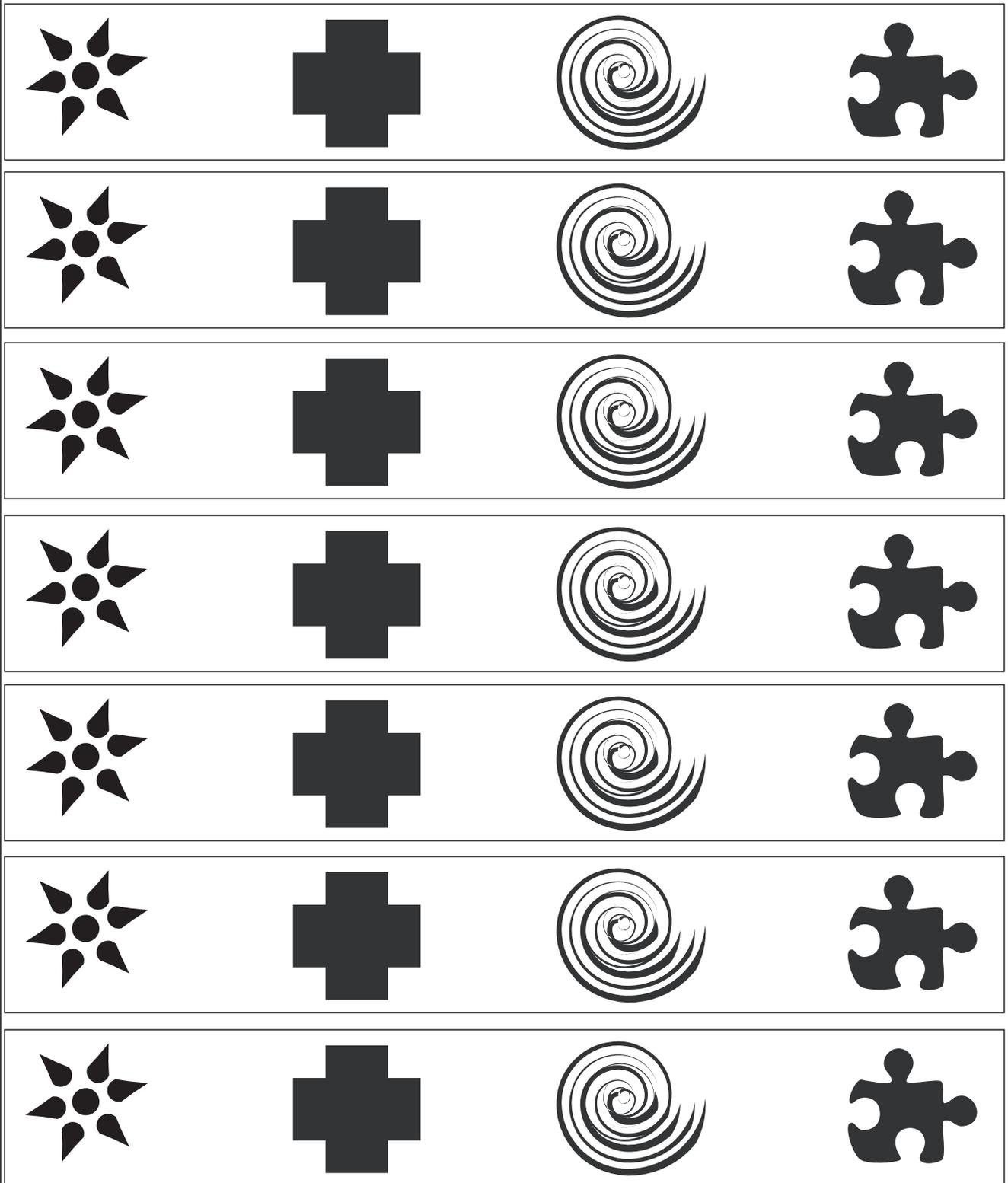
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DNA Strips C



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DNA Strips D



Student Worksheets:

A Recipe for Fish Traits

A chemical called DNA makes a recipe for traits in all organisms. DNA is made of small units (like recipes are made of words, and words are made of letters). Differences in the sequence of these smaller units are what make differences in traits (just like a different sequence of letters make different words, and a different recipe).

Use the Fish Traits Key and the directions below to create and read a DNA recipe to make a drawing of a fish.

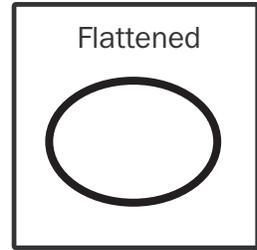
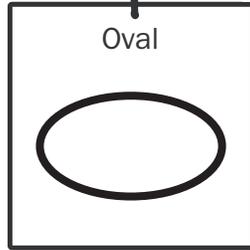
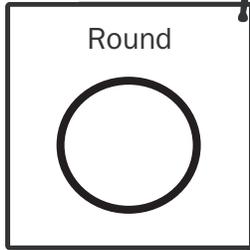
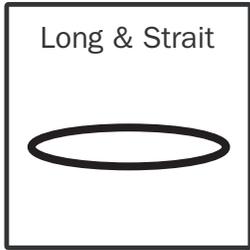
Directions:

1. Make sure you have an envelope containing "Fish DNA"
2. Determine the Body Shape of your fish by picking a piece of Fish DNA out of the envelope.
3. On the **Fish Traits Key** circle the picture for Body Shape that matches the DNA piece that you picked.
4. Set the piece of DNA aside and repeat steps 1-3 for the next trait on the key.
5. After circling the matching picture, paperclip or tape the second piece of DNA to the first to make one long strip. This will become the DNA recipe for your entire fish.
6. Repeat these steps for each of the traits listed on the Fish Traits Key.
7. When you have finished, draw your resulting fish, with all of its circled traits together, on a separate piece of paper.

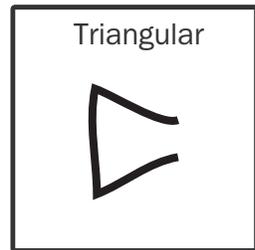
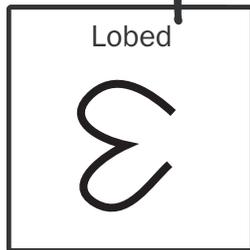
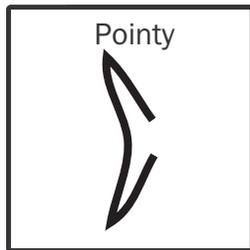
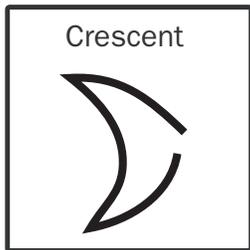
When you have finished, hang the picture of your fish up along with its DNA recipe (the DNA pieces you chose attached in a long strip). Is your fish different or the same as others in the class?

Fish Traits Key

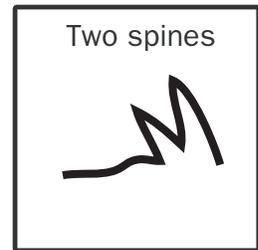
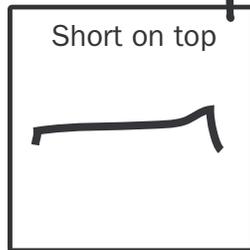
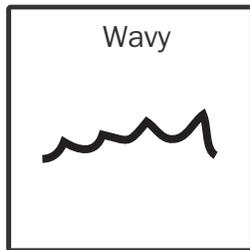
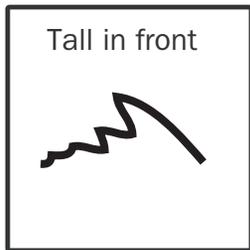
Body Shape



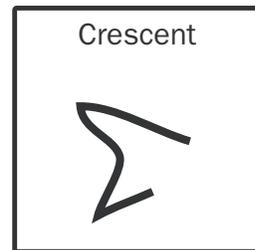
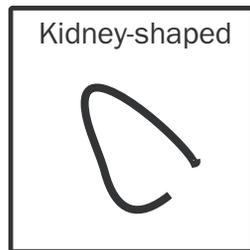
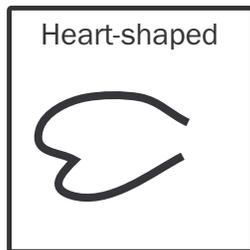
Tail Fin Shape



Dorsal Fin Shape

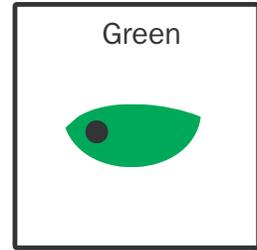
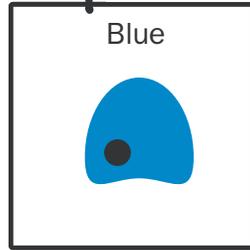
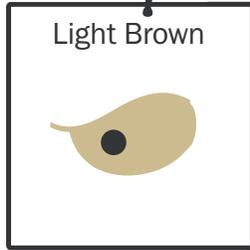
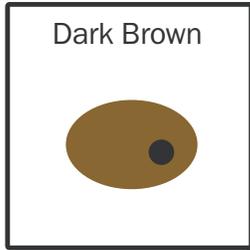


Pectoral Fin Shape

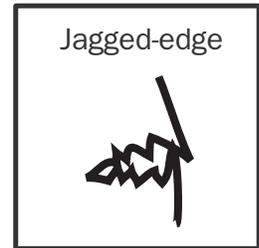
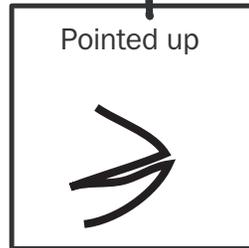
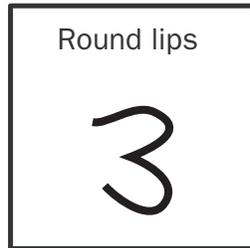
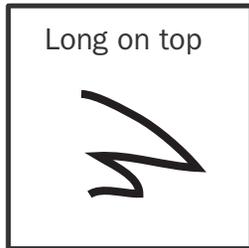


Fish Traits Key

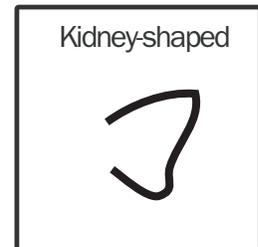
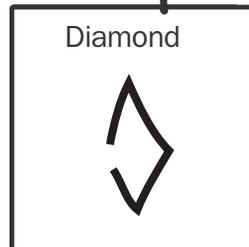
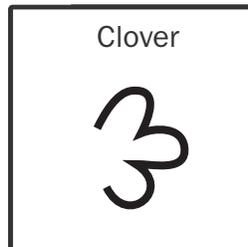
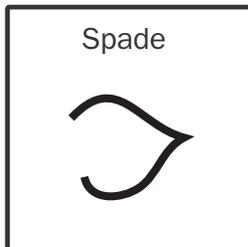
Eye Shape



Mouth Shape



Scales Shape



Scales Color

