Central Dogma

Teacher Instructions for Transcription

This lesson will result in the second panel of the 3-panel (total) art project. Please note that the art instruction and the science instruction are integrated and intended to "flow" together.

Prior to beginning this second panel of the art project, there should be a discussion of the various types of RNA; specifically mRNA, tRNA, and rRNA.

<u>Undertaking the Project</u>

1. By referring to Placemat 1, students transcribe the DNA code from the template strand onto the mRNA space on Placemat 2. (See Transcription Placemat)

Emphasize: coding strand v. template strand of DNA, AND the new nitrogen base that replaces thymine, uracil (U). Students will follow the same basic procedure as in the previous panel:

- Write the appropriate nitrogen base letters in the designated "box" under the mRNA heading.
- Tick mark the appropriate color, using the same key that was developed in Lesson 2.
- Each student should check their work with a neighbor to confirm their letter and color choices.

Note: If mistakes are made, this can be an appropriate time to include a discussion of mutations. For example, students could be asked to classify their error as an insertion, deletion, or substitution type of mutation.

Some students will begin to see that the mRNA strand contains the same letters in the same order as the DNA coding strand, with the exception of U substituted for T. This is great! This observation can drive home the notion that the coding strand provides the "recipe" that will later be read by the ribosome and result in a chain of amino acids.

2. Once the DNA code has been transcribed onto Placemat 2, the unzipped DNA strands (the two torn pieces of printmaking paper with the color coded swatches) should be "annealed" and attached to the first panel of poster board. Use doubled-sided mounting (foam) tape to attach the two separate pieces in close enough proximity to indicate that they have annealed.

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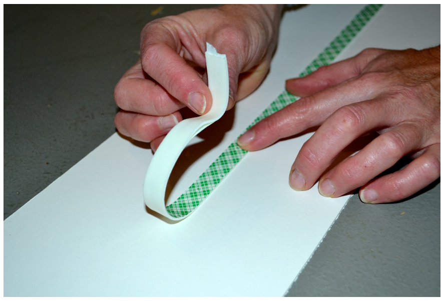
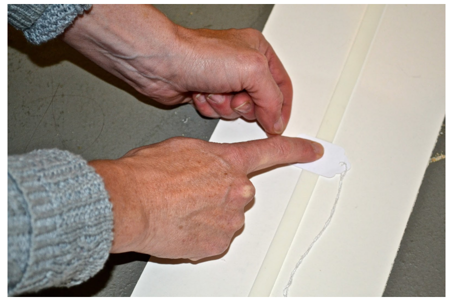
3. Stick a 22” piece of doubled-sided mounting (foam) tape down the length of the second panel of poster board, centering it side to side and top to bottom. Starting with the middle nucleotide (the 12th letter, i.e., “G” on the DNA template strand), stick delivery tag opposite each nitrogen base, on top of the double sided foam tape.





Working toward each end (top and bottom) of the sequence, stick the remaining 22 delivery tags to the tape. (Placing the labels in this order helps maintain alignment with the DNA sequence.) There should be no space or any overlap between the delivery tags. The tags are oriented horizontally, with the string on the right-hand side. There should be 23 delivery tags total, symbolizing the 23 nitrogen bases in the mRNA code.

This is a good time to pause in the art instruction. Make sure to ask students: “What symbolic meaning might ***delivery*** tags have in this particular panel?” Allow students an opportunity to generate a metaphorical connection between ***delivery*** tags as an artistic substrate and messenger RNA. Make sure that students know where in the cell these processes happen … that the DNA never leaves the nucleus and once mRNA copies the code from the template strand, the mRNA ***delivers*** the message to the ribosome where it will be translated into protein.

4. Using watercolor pencils, students crosshatch color-coded squares on the delivery tags, matching the appropriate nitrogen base to the color specified by the key. Next, using small paint brushes dipped in a very small amount of water, moisten the cross-hatched, colored squares until the hatch marks are blended and disappear. This step is critical for the artistic component, because adding water causes the pencil marks to behave as if it were watercolor paint. If you skip this step, you simply have the appearance of colored pencils and you lose the aesthetic value of the watercolor medium.