PROTEIN SYNTHESIS MAKES SENSE!

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Purpose: To help students understand the role of DNA, mRNA, tRNA, and amino acids in the process of protein synthesis. This activity can also be used to introduce the concept of mutations.

Introduction: Students will use the steps of transcription and translation to assemble a protein that forms a sentence. Members of groups will use the handout to work through each step of the process. Group sizes of 2 or 3 work best.

Nucleus: A table (or the floor) in the middle of the room which holds the DNA code cards. There are 20 different double strands of DNA. The **bold** stand represents the template strand and is the one that will be used during transcription. **None of the DNA cards can leave the nucleus.** Students will try to take them to their desks; emphasize why they must transcribe them in the nucleus. The first step is unzipping (un-Velcro) the double strand of DNA. They must copy the bold DNA template onto the top strand in the nucleus on their handout. This strand should be labeled "Template DNA". The students must transcribe the RNA code from the template stand of DNA onto the bottom strand in the nucleus on their handout. This strand should be labeled "mRNA" and the process should be labeled "Transcription." This entire process should be done while in the area of the nucleus, because DNA cannot leave the nucleus. Tell them to record the number that is on the DNA card—it makes checking for accuracy easier later.

Ribosome: The student desks or tables are the ribosomes, this is where they will decode the mRNA codons to know which tRNA they need to find the correct amino acids (words). The mRNA molecule should be copied onto the ribosome at the bottom of the handout. The dotted arrow represents the mRNA molecule leaving the nucleus and combining with a ribosome. Using the mRNA, they determine the correct anticodon for each on the tRNA's above the strand.

tRNA: After they have identified the tRNA anticodons, anticodon cards are distributed around the perimeter of the room. Each anticodon card has a word on the back. When assembled in the correct order the sentence will read: "Start—sentence (some silly)—Stop." If the anticodon cards are clustered with all those beginning with the same letter in the same part of the room, students can find the cards quicker.

Report Your Protein: Student groups will read their sentence to the teacher. (It is easiest for you to check if they tell you the number of the DNA card.) If it is not correct, they have to go back and begin again to determine when their mutation occurred.

WATCH OUT FOR <u>MUTATIONS</u>!!! If students incorrectly transcribe the DNA or mRNA, then a mutation will occur and the sentence will not make sense or not be complete.

Materials:
20 DNA template cards
64 Anticodon cards
Students need diagram worksheet and pencil

Teacher Preparation:

- Print the DNA strands on cardstock. Cut the double strand into two pieces. Cut close to the template DNA and leave room above the complementary strand of DNA as shown by the dotted line on DNA strand 1.
- Once you have laminated the cards, place pieces of Velcro on the extra space on the complementary strand. Position the other side of the Velcro on the template strand so that the nitrogen bases of the two strands lay right next to each other.
- Make tRNA cards with words on back. Make sure the right words on are the back of each anticodon card. They are made to be run front and back.

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