Describing Protein Synthesis

LT: I can use text and visual evidence to describe protein synthesis

Standard: 2.1g

Task directions:

1. Make the following note organizer in your notebook:
   *It should take a full sheet of paper.

Description from animation	Summary from text

2. **Watch** the animations on
   transcription (https://www.stolaf.edu/people/giannini/transcription.html)
   and translation (https://www.stolaf.edu/people/giannini/translation.html)

   Describe what you see in your own words (don't worry about specific vocabulary at this stage). Write your observations in the left-hand column.

3. **Read** the text on "Protein Synthesis" (next page) and **summarize** the keys ideas in the right-hand column.

4. **Draw** an arrow connecting your description from the left to the summary on the right-hand side.

5. Write a final **summary** of the entire process, using the appropriate scientific vocabulary.

6. Explore the following links and take notes on new discoveries:
   http://learn.genetics.utah.edu/content/basics/transcribe/
   http://learn.genetics.utah.edu/content/basics/centraldogma/

What is Protein Synthesis?

Protein synthesis is the process by which cells make proteins. These proteins are used in a variety of biochemical processes and often determines the traits of an organism. For example, through protein synthesis, skin cells produce a protein called melanin that is responsible for determining skin color. The information detailing the production of a specific protein is usually contained in one section of DNA, called a **gene**. However, sometimes multiple genes provide the information to produce a single protein or trait, or one gene can influence multiple proteins and traits. Some stretches of DNA do not code for proteins at all.

In **eukaryotes**, the first step of protein synthesis (called **transcription**) begins in the **nucleus** of the cell. An enzyme unwinds the needed section of DNA and using **base-pairing**, creates a complementary single strand of RNA. In base-pairing the original DNA strand is used as a template, and the enzyme matches up the corresponding RNA nucleotides (base). This single RNA strand is called **messenger RNA** (mRNA) and since it is smaller than a DNA molecule, it can leave the nucleus through tiny openings called nuclear pores. The DNA itself does not leave the nucleus, therefore the mRNA serves as a copy of the original genetic information found in the DNA.

Once the mRNA is in the cytoplasm, it can interact with an organelle called the **ribosome**. Once the mRNA has reached the ribosome, the second phase of protein synthesis, called **translation**, can begin. Within the ribosome, the information coded in the messenger RNA is translated into an amino acid sequence which will form a protein.

The first step in translation is when a molecule called **transfer RNA** (tRNA) approaches the messenger RNA. Transfer RNA is an interesting molecule that can be divided up into two parts. On the bottom, it posses a specific sequence of 3 bases, called an **anticodon**. On the top, it holds a specific **amino acid** that corresponds with its' anticodon.

Within the ribosome, a transfer RNA matches up with a complementary 3 base sequence (called a **codon**) on the messenger RNA strand. Once it has matched up, or binded, with the mRNA strand, it releases its' amino acid. Then, another tRNA that is complementary to the next codon on the mRNA binds with the mRNA, and leaves its' amino acid. The amino acids bind together to form a specific sequence, and eventually a protein. Therefore, the sequence of bases found in the mRNA are *translated* into a set amino acids that bind to form a protein. Each protein is made up of a unique sequence of amino acids that are formed based on the information originally contained in DNA.