**Protein Synthesis Biology** Grade: 9-10 **Standard B.5.3**

**Title of Investigation**: Developing An Understanding of Protein Synthesis

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**Science Standard**:

B.5.3 Describe the process by which DNA directs the production of a protein within a cell.

**Leading Question:** What is the relationship between DNA and protein production? Discuss this with your class.

**Summary of the Investigation:** Show video clip of transcription leaving the sound off. Have students watch and try to explain what steps they see occurring. Repeat the video or slow it down as needed. Discuss their results in a white board activity. Show the video clip of translation with the sound off and see what steps the students can identify in a white board activity. Then have them do the online activity on base pairing and transcription and translation. As a final assessment, have students take a DNA sequence and determine what amino acids are made before and after a change is made in a sequence.

**Equipment Used:**

Computers with internet access, white boards and markers, LCD projector

**Description of Procedures, notes (teacher manual):**

Project HHMI video for entire class with no sound (Show video twice).

<http://www.hhmi.org/biointeractive/dna/DNAi_transcription_vo1.html>

Possible questions if needed: What do you think is happening? Where might this be happening? What structures seem to be involved?

Group students and ask them to describe their observations on whiteboards ? Or ask the students to write down 3 questions they have after watching the videos and then show the video again.

Students will work through an online transcription/translation activity. This may be done as a class, in groups or individually depending on computer access.

Classzone.com (Choose Indiana & Science; enter. Choose the “caiman” book. Animated Biology, Genetics chapter, how to build a protein)

Note: The above might be done differently just in diagrams or student oral presentations instead of whiteboards.

Show the Transcription and Translation animation again. This time students will explain/sketch process on whiteboards using vocabulary they have learned from the online activity.

Show HHMI Translation Animation for the entire class without sound.

<http://www.hhmi.org/biointeractive/dna/DNAi_transcription_vo1.html>

Group students and ask them to describe their observations on whiteboards (10-15 minutes). Explain how this process relates to translation. Where is this process taking place? Show the video again as needed.

Translation Activity (of your choosing)

Possible options:

<http://learn.genetics.utah.edu/content/begin/dna/transcribe/>

[http://www.pbs.org/wgbh/aso/tryit/dna/#](http://www.pbs.org/wgbh/aso/tryit/dna/)

<http://www.biologycorner.com/worksheets/trans_coloring.html>

<http://wardsci.com/product.asp_Q_pn_E_IG0007521_A_name_E_DNA+Structure+and+Protein+Synthesis+Simulation+Lab+Activity>

Whiteboard Application Session – Go through Transcription/ Translation Process before and after a change has occurred in the DNA. Give some groups a deletion, some an insertion and some a point mutation.

**Follow-up Questions:**

How did the change in the DNA affect the protein that was synthesized?

In what way did different changes in the DNA produce different changes in the amino acid sequences?

How do the changes in the protein affect its function?