**Technology-Integrated Lesson Plan**

Topic: Genetic Mutations Date: 11/2/11

NSES: Teaching Standards B & D; Assessment Standard B; Content Standard C

SOL: BIO.6e The student will investigate and understand common mechanisms of inheritance and protein synthesis. Key concepts include genetic variation (mutation, recombination, deletions, additions to DNA).

Grade level: 10th grade Biology Subject: General Biology

Daily Question: What is the difference between base substitution mutations and frame-shift substitutions, and why might they create nonfunctional proteins?

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| Procedures for Learning Experience | Guiding Questions | Materials Needed | **E**valuation (Assessment) | Approximate Time Needed |
| **E**ngagement: Present the students with a picture of different superheroes that underwent gene mutations to gain their superpowers.  Provide students with mini Gene Mutation Templates. Use this **hands-on activity** to have them create mutations and show how the DNA strand is affected. | What do all of these super- heroes have in common?  How did they acquire their superpowers?  Where can mutations occur?  How many different mutations do you think you can create?  How do these mutations affect the rest of the DNA strands? | **PowerPoint presentation**, mini Gene Mutation Templates | Informal evaluation of student involvement and engagement | 15 minutes |
| **E**xploration: Pass out worksheets and have the students follow along as the teacher reads the introduction aloud.  Students will complete a **Gene Mutations worksheet** with a partner to develop their own understanding of the topic. | What are the different kinds of base substitution mutations and what do they affect genes?  What is the difference between substitution mutations and frame-shift mutations?  Why do you think that mutated proteins might not be functional? | Gene Mutations worksheet | Informal evaluation of student participation  Formal evaluation of completion of worksheet, correct manipulation of DNA sequences, and thoughtful answers to discussion questions | 20 minutes |
| **E**xplanation: Present a **PowerPoint presentation on Genetic Mutations** (includes links to relevant **video clips**).  Finish lecture with **YouTube** link to my Gene Mutation Song. | What is a gene mutation?  What are the different kinds of gene mutations?  How do gene mutations affect protein function?  Are there good mutations? | **PowerPoint, Computer, Projector**, Gene Mutation Template | Informal evaluation of student engagement and student response to discussion questions. | 20 minutes |
| **E**xtension: Students will form groups of four based on seating arrangement to **research** different diseases caused by genetic mutations. Diseases include: Phenylketonuria (PKU), Sickle Cell Disease, Cystic Fibrosis,  Severe Combined Immunodeficiency Syndrome (SCID), Duchenne Muscular Dystrophy (DMD), Parkinson’s Disease, and Skin Cancer.  Students will then quickly **present their findings** to the class.  While presenting, students will fill out our pre-made note-taking forms on the various diseases. | What is this disease?  What genetic mutation caused this disease?  What are some symptoms and treatment options? | **Laptops, Internet access**, poster board, markers, Note-taking forms | Formal evaluation of poster with all questions answered.  Formal evaluation of oral presentation quality.  Informal evaluation of group member participation. | 10 minutes for research  10 minutes for poster creation  10 minutes for oral  presentations |

**Notes:**

* Have poster materials set out on counter so students can retrieve materials quickly (will reduce confusion and transition time)
* Allow students to answer questions during the lesson without raising their hands to speed up lecture, remind them that they must be respectful and not talk over others though (if does not work, resort back to hand raising)
* Have laptops set out on desks, but students are only allowed to open after finish worksheet and during disease research
* Students can visit three pre-approved websites if finish the genetic worksheet early
* Use the Genetic Mutation Template (home-made) to demonstrate different gene mutations

**Plan B:**

Should my technology decide to fail me, I would simply conduct the lecture portion using the blackboard, and ask students to take notes on the material I present. For the extension activity, in which students will be conducting independent research and presenting their findings about a particular genetic disease, I could simply bring in sample articles that contain the relevant information for each disease that they will need to look up. While I don’t like the fact that this alternative won’t provide students with the same freedom and responsibility, it is still a suitable way to address the problem of technological failure.

\*\*Here is a list & description of the approved websites that students can explore after completing the worksheet

•[http://nature.ca/genome/04/0413\_e.cfm#010](http://nature.ca/genome/04/0413_e.cfm)

 (Turn your name into a DNA sequence & test out different mutations on it)

•<http://www.dnai.org/lesson/go/1738/1419>

 (Interactive video tutorial with 3D animation & narration)

•<http://molo.concord.org/database/activities/102.html>  (Interactive mutation simulation--requires Java)