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Week 3: Cells & Genetics

Module 4: Types of Genetic Mutation

Lesson: Why Some DNA Changes Matter More Than Others

Lesson Overview

Students deepen their understanding of genetics by comparing different types of DNA mutations and their effects on proteins. They use evidence to evaluate why some mutations have little impact while others significantly disrupt body function.

Learning Targets

Identify different types of DNA mutations.

Compare how different mutations affect proteins.

Use evidence to explain why some mutations cause bigger problems than others.

Vocabulary

Mutation
a change in DNA

Substitution
one DNA letter is replaced

Insertion
extra DNA letters are added

Deletion
DNA letters are removed

Duplication
a section of DNA is repeated

Frameshift
a mutation that changes how the code is read

Materials

DNA sentence strips
Mutation cards (substitution, insertion, deletion, duplication)
Scenario or comparison cards
Chart paper or whiteboard
Student notebooks

Instructional Notes

This lesson builds on students' understanding that DNA controls proteins and proteins control body function. The key shift is helping students recognize that different mutation types can have different effects. Students often assume all mutations are harmful. Focus on comparison, evidence, and reasoning to refine that understanding.



Learning Experience

8 min	Opening	Display the sentence: "THE CAT ATE THE RAT" Explain that each group of three letters represents one "protein piece." Assign each group one mutation type: substitution, insertion, deletion, or duplication. Direct students to apply their assigned mutation to the sentence. Then ask: "Does the message still make sense? Why or why not?" Avoid explaining the answer at this point. Focus on observation and comparison. Students rewrite the sentence using their assigned mutation. They determine whether the message still makes sense, compare the original sentence to the mutated version, use evidence from the sentence to support their reasoning, and share results and explain what changed.
15 min	Module	Focus: How do different types of mutations affect proteins differently? Guiding Questions: • What are the main types of mutations? • How do mutations change DNA sequences? • Which mutations have the largest effect on proteins? Quick Checks: • Turn-and-talk: "Which mutation changes the most information?"
15 min	Application	Introduce the challenge: "You are part of a genetics communication team. A genetic testing company is preparing reports for patients who learn they have a DNA mutation. Before the reports are released, your team must determine which explanation communicates the science most accurately." Provide the patient explanations below. Students: Step 1: Read the Patient Explanations Read all four explanations. Explanation A "A mutation was found in your DNA. Mutations are dangerous and can cause disease." Explanation B "A mutation was found in your DNA. Some mutations affect proteins while others have very little effect." Explanation C "A mutation was found in your DNA. Scientists must investigate how the mutation affects proteins before determining its impact." Explanation D "A mutation was found in your DNA. Because DNA changed, health problems will occur." Step 2: Choose the Best Explanation Work with your group. Decide which explanation is the most accurate. Be prepared to explain your choice using evidence from today's learning. Step 3: Improve the Explanation Write a better explanation for patients.



		Your explanation should: • Explain what a mutation is. • Explain that mutations can have different effects. • Explain why scientists study proteins when evaluating mutations.
2 min	Reflection	Two people can have a mutation in the same gene, but their lives may be affected very differently. One person never develops any noticeable problems. Another person experiences symptoms that affect their daily life. Based on what you learned today, why might predicting the effects of a mutation be more difficult than simply finding a change in DNA? Sentence Frame: "Predicting the effects of a mutation can be difficult because _____. Even if two people have a mutation in the same gene, _____. Scientists need to understand _____ before they can predict how the mutation might affect the body."
2 min	Career Connections	Genetic scientists, genetic counselors, and doctors study mutations to determine how they affect health. Some mutations have little or no effect, while others can significantly change how proteins function and how the body works. Understanding mutation types helps professionals diagnose conditions, explain health risks, predict outcomes, and develop treatments. The reasoning students used today—comparing evidence and evaluating impact—is similar to the work done in genetics, medicine, and biomedical research.