Mutation_World
Student Instructions

This Minecraft-based model will help you explore different types of mutations and their consequences.

How to use the model

For those who never played Minecraft before – simple instructions

What do you want to do?	Action in the game	How to control?
Walk in different directions	Move	Press W/A/S/D
Change where you are facing	Move around	Move the mouse
Jump	Jump	Press space
Interact with objects (e.g. read books, press a button)	Read/Activate mechanisms	Right-click on the object
Understand what is happening	Read messages	Look at the bottom of the screen (or press T if you missed it to see message history)

Start the model
Launch Minecraft, select Play, then Single Player, and enter the “Mutations_World”.

Read the book
When you enter the world, turn back 180 degrees to adjust your direction.

Start to explore the model when you are facing the lectern and the book.

For a summary of what the model contains, right-click the book on the lectern.

Explore Part 1 - Substitution Mutation
Follow the arrows on the flags to reach the first part, Substitution Mutation.

Right-click all the buttons in front of you to trigger animations and messages. Pay attention to the text that appears at the bottom of your screen – it explains what is happening.

Once you finish exploring all DNA substitution mutation points, you will be teleported to the mRNA area. Again, right-click each button to see the differences between the normal and mutated transcribed mRNA and the translated peptide chain.

Explore Part 2 – Frameshift Mutation

You will be automatically teleported to the second part, Frameshift Mutation, after seeing the peptide chains in Part 1. Again, right-click all buttons in front of you to see what happens.

Question 1:
What is the effect of the frameshift mutation on the resulting protein?

Answer:

Explore Part 3 – Nonsense Mutation

You will be automatically teleported to the third part, Nonsense Mutation, after finishing Part 2. Again, right-click all buttons in front of you to see what happens. Then, follow the arrows to find the reading frames. In the sequence with a nonsense mutation, the codon becomes a stop codon.

Next, follow the arrow and you will see two bridges made of amino acids. One is shorter due to the nonsense mutation. Choose one to go across the river. This is the end of the model. Congratulations!

A nonsense mutation causes a protein to be truncated. This often leads to a non-functional protein.

Question 2:
If the protein is an enzyme, what are the likely consequences for the cell or organism?

Answer: