Mutation_World
Lesson Plan

LEARNING OBJECTIVES AND OUTCOMES

- Comparing two genetic sequences in a visual way.
- Distinguishing different types of mutations.
- Understanding how DNA mutations affect the transcribed mRNA and the translated amino acids and peptide chains.

BACKGROUND LEARNING – before the workshop

To benefit most from this workshop, students should have been taught about point mutations (single-gene mutations) beforehand, including concepts of substitution, missense, insertion, deletion and nonsense mutations. The workshop is intended to reinforce these concepts and make them easier to understand.

To deliver the workshop, laptops running Minecraft: Java Edition are required. Other versions of Minecraft (e.g. Minecraft: Education Edition) may not be suitable for the model.

Install the Minecraft model as documented in “README - Mutation_World Installation”. Remove and re-install the model before each new instance of the workshop.

GENERAL INFORMATION

Timings are approximate and assume a total of maximum **40** minutes. Particularly with smaller groups, if students are familiar with Minecraft, it may be possible to complete the workshop a little faster.

Students should work in **pairs** where possible. Typically, one student in the pair will be at the controls while the other advises and observed. Half-way through, consider asking every pair to switch, so the other member of the pair is at the controls.

The general structure of the workshop is:

- Starter Activity
- Main Activity
- Discussion
- Wrap-up

STARTER ACTIVITY – 5 minutes – 0:00 to 0:05

Interaction with students about mutations

Some example questions to discuss with students

What is a mutation?

Could anyone tell us one of the types of a mutation?

Quick introduction to the model

A model has developed in Minecraft, showing substitution and frameshift mutations, and how these mutations affect the amino acid sequence and the length of the peptide chain.

Hand out instructions of the model

Although Minecraft is a popular game world-wide, bearing in mind that not every student is a huge fan. Some may never have played Minecraft before and will require help with the controls.

MAIN ACTIVITY – 20 minutes – 00:05 to 00:25

Students read through the instructions and work through the model.

Teacher observes and helps students in need.

DISCUSSION – max. 10 minutes – 00:25 to max. 00:35

Some example questions to discuss with students

What types of mutation did you observe in the model?

How did each mutation affect the peptide chain?

What is the effect of a substitution mutation on the peptide chain?

What were the consequences of the frameshift mutation for the peptide chain?

Is there any real-life disease you can think of which is caused by a mutation?

WRAP-UP – max. 5 minutes – max. 00:35 to max. 00:40

Review the course content and reflect on take-home messages.