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1. Mutations and Superpowers

BIOS4YOU
AR 2.0

BIO-INSPIRED STEM TOPICS FOR ENGAGING YOUNG GENERATIONS
THANKS TO THE USE OF AUGMENTED REALITY

Project Number: 2023-1-DE03-KA220-SCH-000126516

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General information

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Name of the exercise:	Hollywood vs Reality (Delightex AR Quiz)
Description of the exercises:	This activity is an AR-based interactive quiz created in Delightex. It helps students check and consolidate key ideas from the learning unit “Mutations: Nature, Causes, and Effects on Organisms.” Students meet a short introduction in AR, then complete a 10-question quiz about mutations. The questions focus on: ● what mutations are and where they happen in DNA, ● why most mutations do not create “superpowers,” ● the difference between silent/synonymous, missense, and nonsense mutations, ● larger mutations such as insertions, deletions, duplications, inversions, translocations, ● how mutations occur (replication errors, UV radiation, chemicals), ● which mutations can be inherited (germline vs somatic) Students answer on their device and receive immediate feedback after each question. Correct answers reinforce the concept; incorrect answers include a short explanation and a hint to review the unit text.
Participants:	Individual playthrough on device (phone/tablet/computer).Optional teacher-led discussion after the quiz (compare answers and clarify misconceptions).
Participants’ age range:	14–18 years
STEM subject and specific topic:	Biology / Genetics. Topic: Mutation types, causes, effects on organisms, and the “superpowers vs reality” idea.
Gamification process:	The quiz is framed as a short mission: “Reality Check: Mutation Detective.” ● Each correct answer = “Evidence collected!” ● Each wrong answer = “Check the clue again!” ● Final message = “Mission complete” + reflection prompt.

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Written or graphic description of Augmented info:	AR flow & roles (simple and readable on phones): ● Guide/host (optional): a simple 3D character (scientist / "Mutation Detective") ● Opening line (intro panel): "Welcome to Mutation Quest! Read each question carefully and choose the best answer. This mission helps you separate Hollywood myths from real genetics." Question display: ● A large Quiz panel (preferred) with short question text + 3 answer options (A/B/C) OR 4 options if you prefer. ● Keep each question short and put long explanations into feedback. Answer input: ● Delightex Quiz element (best option, touch-friendly). Feedback: ● Correct: "Correct ✅ Evidence collected!" + 1 short explanation ● Incorrect: "Not quite ❌ Hint: ..." + 1 short explanation (Feedback text is based on the unit content.) Final screen message: "Mission complete! You reviewed what mutations are, how they happen, and why they usually don't create superpowers. Reflection: Which mutation type seems most dangerous and why?"
External (or extra) tools required	Delightex Studio (web-based; free version is enough). Device with internet connection (phone/tablet/PC). Camera optional (if you use AR mode).
Links (video, images, text online and so on).	Delightex Studio: https://edu.delightex.com/ Source text: "Mutations: Nature, Causes, and Effects on Organisms" (provided by teacher)

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Pedagogical specifications

How can this augmented information be used to address a STEAM topic in a more interesting way for students?

AR turns abstract genetics into an interactive experience. Instead of only reading definitions, students actively answer questions, receive instant feedback, and connect the topic to popular culture ("superpowers"). The mission format makes students curious and supports engagement, while the visual AR setting helps them remember key terms and processes.

Which pedagogical objectives are addressed through this scenario?

Build correct understanding of mutation definitions and types.
Develop scientific literacy: distinguish fiction from real biology.
Strengthen recall and application of key concepts (e.g., missense vs nonsense).
Support critical thinking through explanation-based feedback.
Practice digital skills through interactive learning in Delightex.

Which results are expected to be reached with its use?

After the quiz, students should be able to:
define mutation and genome in simple scientific terms;
identify main mutation types and give basic examples;
explain why many mutations are neutral or harmful;
describe causes of mutations (replication errors, UV, chemicals);
explain which mutations can be inherited (germline vs somatic).

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Which benefits are expected to be reached with its use?

Higher motivation and attention compared to a worksheet quiz.
Faster identification of misunderstandings (immediate feedback).
Better retention due to short, repeated exposure to key terms.
More confident participation in class discussion after the AR activity.

Technical specifications

AR INFORMATION

Technology	Delightex Studio (web-based) https://edu.delightex.com/Studio/Spaces
If it's needed a marker, description of the marker	https://edu.delightex.com/RXT-VMW RXT VMW
Hardware and software	Teacher: PC/laptop to build the space in Delightex Studio. Students: smartphone/tablet/PC with internet connection.

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needed:	Camera-enabled device recommended if using AR mode.
Type of Augmented data	Text: questions, answers, feedback, intro and final message. Images (optional): simple icons (DNA, warning sign, check/cross). 3D models (optional): DNA helix, chromosome, small “scientist” avatar from Delightex library. Audio (optional): short correct/incorrect sound cues.

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Written description of the AR data

Students open the Delightex quiz link. A short introduction panel explains the goal: to test understanding of mutations and separate "Hollywood superpowers" from scientific reality. The activity then runs as a 10-question interactive quiz. Each question appears on a quiz panel with multiple answer choices. Students tap the answer on screen.
After each response, immediate feedback appears:

- **Correct:** confirmation + a short explanation linked to the unit content.
- **Incorrect:** correction + short hint to re-check the concept.
  After the last question, students see a final summary message and a reflection question for discussion.

Q1. What is a mutation?
A) A planned change made by the body
B) A change in the DNA sequence ✅
C) A new organ that grows suddenly
Correct feedback: "Yes. A mutation is a change in the DNA sequence."
Incorrect feedback: "A mutation is a DNA change, not a planned body upgrade."

Q2. Why don't mutations usually create superpowers like in movies?
A) Because most mutations are small and often harmful or neutral ✅
B) Because DNA never changes
C) Because mutations only happen in animals
Correct feedback: "Right. Most mutations don't create dramatic new abilities."
Incorrect feedback: "Movies exaggerate. Most mutations are small and not 'power-giving'."

Q3. A point mutation changes...
A) One DNA letter (nucleotide) ✅
B) A whole chromosome
C) Only the environment
Correct feedback: "Correct. A point mutation swaps one nucleotide."
Incorrect feedback: "Point = single letter change in DNA."

Q4. A synonymous mutation means...
A) The amino acid stays the same ✅

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B) The whole gene disappears
C) The chromosome flips
Correct feedback: “Yes. DNA changes, but the amino acid does not.”
Incorrect feedback: “Synonymous = same amino acid, because the genetic code is redundant.”

Q5. A missense mutation...
A) Changes one amino acid to another ✅
B) Creates an early stop codon
C) Adds a whole new chromosome
Correct feedback: “Correct. Missense changes an amino acid and may change protein function.”
Incorrect feedback: “Missense = amino acid substitution, not a stop signal.”

Q6. A nonsense mutation...
A) Creates an early stop codon ✅
B) Makes the protein longer
C) Has no effect on proteins
Correct feedback: “Right. It can produce a shortened protein that often doesn’t work.”
Incorrect feedback: “Nonsense = early stop codon → shorter protein.”

Q7. A frameshift mutation can happen when...
A) Insertions/deletions are not divisible by 3 ✅
B) A mutation happens in hair cells only
C) DNA becomes stronger
Correct feedback: “Correct. The reading frame shifts and the protein often becomes nonfunctional.”
Incorrect feedback: “Frameshift = insertion/deletion changes reading frame (not ×3).”

Q8. Which factor can cause mutations?
A) UV radiation ✅
B) Drinking water
C) Sleeping
Correct feedback: “Yes. UV can damage DNA and lead to mutations.”
Incorrect feedback: “Mutagens include UV radiation and some chemicals.”

Q9. Which mutations can be passed to the next generation?
A) Only mutations in germ cells (sperm/egg) ✅

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B) Only mutations in skin cells
C) All mutations in the body
Correct feedback: “Correct. Germ cell mutations can be inherited.”
Incorrect feedback: “Somatic mutations stay in the body; germline can be inherited.”

Q10. A balanced translocation means…
A) DNA is rearranged but no genetic material is gained/lost ✅
B) A chromosome disappears
C) A gene is always duplicated
Correct feedback: “Right. Balanced = rearranged, but no net loss/gain.”
Incorrect feedback: “Balanced translocation rearranges DNA without losing or gaining it.”

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If Image	-
If Text	-
If video	-
If audio	-
If 3D model	The formats needed are: .obj, .stl, .glb/.gltf

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