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The Risks of Gene Editing: What Could Go Wrong?

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:	"The Risks of Gene Editing: What Could Go Wrong?" AR App
Description of the exercises:	An AR-based interactive quiz that brings to life key concepts of the risks of gene editing. Students interact with a virtual guide (scientist avatar) who presents them with 5 questions related to gene editing on human genetics, biodiversity, agriculture, and future generations Using their device (phone/tablet), learners select answers by tapping virtual buttons (A, B, C). Immediate feedback ("Correct!" or "Try again!") is shown in AR. After completing the quiz, they receive a final message of success.
Participants:	Individual playthrough on device. Optional group discussion after, to reflect on answers and compare reasoning.
Participants' age range:	14–18 years. Assumes basic knowledge of genetics and gene editing principles, and interest in biology/biotechnology.
STEM subject and specific topic:	Biotechnology Topic: The Risks of Gene Editing: What Could Go Wrong?
Gamification process:	Multiple-choice AR quiz (5 questions). Each correct answer = visual/audio positive feedback. Wrong answer = "Try again!". Final info panel shows "Great job! You completed the AR quiz!".
Written or graphic description of Augmented info:	AR flow & roles. Guide (Scientist avatar) — e.g., *Dr. Nova*. Appears at start and between questions. Opening line: *"Welcome to Gene Editing Quest! I'll ask you 5 quick questions about The Risks of Gene Editing: What Could Go Wrong?. Tap to choose the best answer."* Transition line (after each answer): Correct → *"Correct — well reasoned! Next one..."*

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Incorrect → *“Not this time — try the next!”*

Closing line: *“Great job! You’ve completed Gene Editing Quest.”*

Question display. 3D Text panel (object name: `QuestionText`) centered above the guide; large, high-contrast.

Suggested scale (so it’s readable in AR on phones): X=1.8, Y=1.8, Z=1.8; color: white, outline/shadow on if available.

Each question also appears in a quiz panel (preferred), so the 3D text can show a short header like *“Q1 / Q5”*.

Answer input

Preferred: Quiz panel blocks (built-in). Shows 3 options with one correct. Touch-friendly UI, auto-handles feedback.

Fallback: three virtual buttons (A/B/C) made from flat panels + 3D text; each button is a group (`OptionA/B/C`). On click, show a feedback panel.

Feedback visuals

Correct: green check icon, short “Correct!” text, optional *ding* sound.

Incorrect: red cross icon, “Try again!” text, optional *soft buzz* sound.

Keep messages ≤ 2 seconds so the flow stays quick.

Final screen

Info panel titled “Results” with a short praise line and suggestion:

“Congratulations, you completed Gene Editing Quest! Think: How does gene editing influence future generation and ecosystem?”

Optional link/QR to a reflection form.

Scene layout (static AR diorama)

Mid-height avatar (so students don’t point too far down).

`QuestionText` ~1–1.5 m above the ground plane.

If you keep A/B/C buttons: place them in a horizontal row, spacing

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	~0.5 m, minimum size so each is easy to tap.
External (or extra) tools required	Delightex (CoSpaces Edu) platform — authoring on PC; playback on phones/tablets (ARCore/ARKit). Optional marker (A4, high-contrast) for reliable placement; otherwise markerless plane detection. Post-quiz reflection — quick Google Form or Kahoot to gather misconceptions. Accessibility — optional TTS/voice-over files for questions (short MP3s); captions on any videos you add.
Links (video, images, text online and so on).	https://edu.delightex.com/WQT-TCA

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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?

The use of Augmented Reality (AR) in this exercise makes the complex topic of gene editing more engaging and less intimidating for students. Abstract concepts such as CRISPR, gene mutations, biodiversity, and ethical dilemmas become interactive and visually engaging. Instead of passively reading about gene editing, students interact with a scientist avatar, answer quiz questions presented on 3D panels, and receive immediate feedback through text, colors, and sounds, turning the experience into a game-like challenge.

The session begins with the avatar introducing the topic and setting the mission. It then progresses through five AR-based

Which pedagogical objectives are addressed through this scenario?

The AR exercise *"Gene Editing Quest"* addresses key pedagogical objectives that combine cognitive, emotional, and transversal learning outcomes. Cognitively, it deepens students' understanding of the risks and implications of gene editing by prompting them to recall and apply concepts such as genetic mutations, biodiversity, ethical dilemmas, and the long-term effects of gene modification. Immediate feedback helps consolidate knowledge and correct misconceptions as students interact with each question and scenario.

Emotionally, the playful, game-like format, guided by a friendly scientist avatar, reduces anxiety about complex scientific topics like gene editing, making the material more accessible and engaging. By presenting gene editing as a dynamic, interactive challenge rather than an intimidating concept, students approach the subject with curiosity and excitement,

Which results are expected to be reached with its use?

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The expected results of using this AR exercise *"Gene Editing Quest"* go beyond what can typically be achieved with a traditional textbook-based lesson. On the knowledge level, students are expected to recall and explain key concepts related to the risks and implications of gene editing, such as genetic mutations, ethical concerns, biodiversity impacts, and long-term consequences. Through interactive questioning in a dynamic AR environment and immediate feedback, this knowledge is not only memorized but also actively reinforced, allowing students to deepen their understanding through engagement rather than passive reading.

On a broader scale, the exercise aims to cultivate a more positive and suitable mindset for STEM learning. By transforming complex topics like gene editing into an interactive, game-like experience, it reduces the intimidation factor that many students feel toward genetics and genomics. Students come to see science as something exciting, accessible, and relevant to their world, sparking their curiosity and motivation to explore more. This emotional connection is often hard to achieve through traditional methods, where students typically engage in passive

Which benefits are expected to be reached with its use?

The use of AR in this exercise offers benefits on several levels, enriching both the learning experience and the students' engagement with complex topics like gene editing.

On the **disciplinary level**, students gain a clearer and deeper understanding of challenging genomic concepts such as genetic mutations, biodiversity impacts, ethical concerns, and long-term effects, which are often difficult to visualize. The interactive format of AR allows these topics to come to life in 3D, making them easier to grasp and more memorable than traditional textbooks or static diagrams.

On the **practical and sensory level**, AR engages multiple senses at once—students read, see, interact through touch, and optionally hear feedback. This multisensory approach strengthens retention and makes learning more dynamic. By actively selecting answers and receiving instant responses, students experience science in a hands-on way, almost like a

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Technical specifications

AR INFORMATION

Technology	https://edu.delightex.com/Studio/Spaces Marker 
If it's needed a marker, description of the marker	-
Hardware and software needed:	• PC for teacher to create the space. • Smartphone or tablet with camera (iOS/Android, AR-enabled). • Internet connection for initial loading.
Type of Augmented data	Images (icons for correct/incorrect feedback). Text (questions, answers, instructions). 3D models (scientist avatar, DNA helix, answer buttons). Optional: short sound cues or video clips.

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Written description of the AR data	Students begin the experience by scanning a marker or simply placing the AR scene on a desk or floor using their mobile device or tablet. On their screen, a **scientist avatar** appears and welcomes them to the mission: to complete the *Gene Editing Quest* and test their knowledge. One by one, **five virtual quiz panels** appear with multiple-choice questions about DNA, coding and noncoding regions, enhancers, and chromatin. Students choose answers by tapping virtual buttons. Each choice triggers **immediate feedback**: a green glow and "Correct!" for the right answer, or a red effect and "Try again!" for the wrong one. The AR environment includes simple **static 3D props**, such as a DNA double helix, that appear next to the avatar to reinforce the scientific theme. At the end of the quiz, a final **information panel** congratulates the learner and offers a reflection question linking the activity to classroom discussion. The activity is carried out individually, ensuring that each student interacts directly with the AR content, and can end with a group reflection where students compare answers and discuss misconceptions.
If Image	-
If Text	*Intro (avatar):* "Welcome to Gene Editing Quest! I will ask you 5 questions about *The Risks of Gene Editing: What Could Go Wrong?*. Choose the correct answers and see if you can complete the mission!" *Sample question:* *Question 1:* What's a risk of gene editing in humans? ● *Answer 1:* Unintended genetic mutations ✅ (set as correct) ● *Answer 2:* Stronger, faster humans ● *Answer 3:* Unlimited reproduction *Question 2:* How could gene editing affect biodiversity? ● *Answer 1:* Create new species

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	● *Answer 2:* Reduce genetic diversity ✅ ● *Answer 3:* Eliminate diseases *Question 3:* What's an ethical concern with gene editing? ● *Answer 1:* Designer babies ✅ ● *Answer 2:* Solving environmental problems ● *Answer 3:* Creating better societies *Question 4:* What's a risk of gene editing in agriculture? *Answer 1:* Resilient crops ● *Answer 2:* Cross-breeding with wild plants✅ ● *Answer 3:* Higher yields for all farmers *Question 5:* Why consider long-term effects of gene editing? ● *Answer 1:* Technology might fail ● *Answer 2:* Impact future generations and ecosystems✅ ● *Answer 3:* Only affects the current generation *Final panel:* *"Congratulations, you completed Gene Editing Quest! Think: How does gene editing influence future generation and ecosystem?"*
If video	-
If audio	-
If 3D model	The formats needed are: .obj, .stl, .glb/.gltf

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