



Co-funded by
the European Union

How Biomimicry Inspires New Innovations



BIOS4YOU
AR 2.0

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

Project Number: KA220-BW-23-30-126516

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them."





Co-funded by
the European Union



Project Number: KA220-BW-23-30-126516

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them."



Introduction

The purpose of this document is to create guidelines to help the project staff that are dealing with school children, 14-19 aged, to create and re-adapt exercises using Augmented Reality technology.

To this end, a series of templates have been created that define exercises from a methodological, pedagogical and technological point of view.

A good written description, along with images, videos or sketches of the exercise is very important for experts to understand the idea. This will be part of the “General Information” template.

On the other hand, it will be important to define what STEM topic/subject each exercise is intended for and how AR technology can help students or staff or people interested in it when they use these exercises. In addition, people interested in the exercise can understand the usefulness of augmented information, and it will be necessary to explain the benefits.

During the process of defining the augmented information that each exercise will offer, staff working with teachers will be able to develop innovative ideas that make it easier to learn teaching concepts in an easier way.

All students will be able to view the contents explained by professionals projected in the real world in the form of text, 3D model, image, video, sound... This will help them focus their attention on exercise and more easily assimilate the associated concepts.

This document consists of the following points:

- Information about AR technology
- How to define AR exercise thanks to the template:
 - General information
 - Pedagogical specifications



BIOS4YOU
AR 2.0

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

Project Number: KA220-BW-23-30-126516

“Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.”



- Technical specifications

General information

In this part it will be necessary to report the generic information of the exercise so that it can be recognised.

Name of the exercise:

How Biomimicry Inspires New Innovations

Description of the exercises:

In this interactive AR game, students dive into an underwater world filled with sharks, whales, and dolphins. By clicking on and exploring these creatures, they complete an engaging, interactive quiz that shows how nature inspires new inventions, making learning both fun and hands-on.

Participants:

The activity is designed as a single-player game but requires teamwork: one student plays while another student assists by acting as the “AR model” for the visualization. This encourages collaboration while keeping the core gameplay experience individual.

Group discussions at the end (optional) allow comparison of results and reasoning behind choices, strengthening collaborative learning and peer feedback.

Participants’ age range:

Minimum age: 17 **Maximum age:** 19

This AR game is designed for older high school students who already have a basic understanding of biology or environmental science and are curious about exploring the connections between nature and human design. At this age,



3 GENERATIONS
FACULTY

0-126516

“Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.”





STEM subject and
specific topic:

students are cognitively ready for abstract thinking, ethical reasoning, and real-world problem-solving. The activity builds on these experiences to learn new things through a fun and interactive activity.

Gamification
process:

This learning unit introduces students to biomimicry, the practice of studying natural structures, processes, and systems to inspire human innovation. Through case studies such as the lotus leaf (self-cleaning surfaces), shark skin (antibacterial textures), and termite mounds (sustainable architecture), students see how evolution has already solved many design problems.

Written or graphic
description of
Augmented info:

The game transforms biomimicry into an interactive AR challenge. Students interact with some marine animals, such as: sharks, dolphins and whales; by clicking them and through animations and educational and explanatory quizzes, they learn about how some natural processes and systems have inspired human innovation.

- Animated marine animals
- Information Overlay: Decision Tips and Visual Feedback Effects
- Floating 3D Choices: Marine Animals
- AR environments: seabed

External (or extra)
tools required

The AR experience is anchored via image recognition or QR markers, and requires no physical movement — it's designed to be used at a desk or classroom table.

Links (video,
images, text online
and so on).

Mobile device or tablet with AR capabilities. Internet connection for initial file loading. Printed AR marker sheet (optional) or screen-displayed trigger image.



3 GENERATIONS
FALITY

Project Number: KA220-BW-23-30-126516

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them."





Co-funded by
the European Union



BIOS4YOU AR 2.0

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

Project Number: KA220-BW-23-30-126516

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them."





Pedagogical specifications

Here we will collect information on how to use the exercise in the learning session and the results and benefits of using it, from a pedagogical perspective.

[How can this augmented information be used to address a STEAM](#)

This learning unit will guide students through the fascinating world of biomimicry. Using the three E's methodology — Explore, Execute, Enhance, learners will first discover the science behind nature-inspired designs, then engage in hands-on and AR-supported activities, and finally reflect on how biomimicry could solve real-world problems.

[topic in a more interesting way for students?](#)

[Which pedagogical objectives are addressed through this scenario?](#)

This scenario addresses multiple pedagogical objectives:

Scientific understanding: students strengthen their knowledge of biology, ecosystems, and biomimicry.

Critical and ethical thinking: learners reflect on how natural systems solve problems and how these strategies can inspire sustainable human innovation.

Experiential learning: knowledge is acquired through interactive, hands-on AR activities that foster active engagement.

Collaboration and communication: teamwork is encouraged through the dual roles of player and AR model, as well as through group discussions.

Problem-solving and creativity: students apply nature-inspired principles to propose innovative solutions to real-world challenges.

Environmental awareness: learners develop a deeper appreciation of sustainability and the interconnections between humans and nature.



YOU



BRINGING YOUNG GENERATIONS TO AUGMENTED REALITY

-BW-23-30-126516

Opinions expressed are however those of the project and do not reflect those of the European Union or the European Commission (EACEA). Neither the European Union nor the Commission is responsible for them.



Which results are expected to be reached with its use?

The expected results of using this activity are:

Improved understanding of biomimicry and the invisible world of microbes.
Greater student motivation and engagement thanks to the immersive AR environment.

Development of teamwork and communication skills through collaborative tasks.
Enhanced critical thinking and problem-solving abilities.

Increased creativity by linking natural strategies to new technological ideas.
Stronger awareness of environmental sustainability and ethical considerations in design.

Better retention of scientific concepts due to active, hands-on learning experiences.

— Which benefits are expected to be reached with its use?

Expected Results:

-Students gain a deeper understanding of biomimicry and the role of microbes in human health and ecosystems.

-Learners develop critical thinking by connecting natural strategies with real-world design and technological challenges.

-Students enhance teamwork and communication skills through collaborative play and group discussions.

-Increased engagement and motivation thanks to the interactive and immersive AR environment.

-Development of problem-solving and creativity by applying nature-inspired principles to propose innovative solutions.

-Strengthening of environmental awareness and ethical reasoning about sustainability and human–nature connections.

-Improved retention of scientific concepts through experiential and hands-on learning activities.



YOU



BRINGING YOUNG GENERATIONS TO ENHANCED REALITY

-BW-23-30-126516

Opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.



Technical specifications

In this part it is necessary to specify whether the exercise was designed to be implemented with AR technology. This part is fundamental for the translation process. Please include text, audio text and all the necessary materials.

AR INFORMATION

Technology

<https://edu.delightex.com/Studio/Space/DT1Lff97oUun7d7d>

Marker

If it's needed a marker, description of the marker



Hardware and software needed:

pc, smartphone, tablet, camera.

Type of Augmented data

Images; Text; 3D models;

Written description of the AR data

The AR simulation displays an interactive visualization of biomimicry principles. When students explore natural models such as shark skin, lotus leaves, or termite mounds, the app overlays 3D data showing their structures and functions. Each element is represented with distinctive colors, textures, and animations to



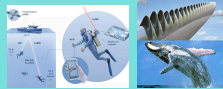
Project Number: KA220-BW-23-30-126516

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them."



highlight its unique biological strategy. Informational pop-ups connect the AR visuals to scientific data, explaining how these natural systems inspire human designs in fields such as architecture, medicine, and technology. Additionally, a dedicated AR quiz section allows students to test their knowledge in a playful and interactive way, reinforcing what they have learned.

If Image



If Text

Dive into an underwater world where sharks, whales, and dolphins hide surprising secrets. Each creature has developed unique strategies to survive, adapt, and thrive. In this educational AR game, you will explore the ocean and, through an interactive quiz, try to guess which everyday inventions are inspired by the marine world. Observe, discover, and let nature guide you as you take on the challenges!

The shark's skin may look smooth, but it is actually covered with tiny scales that create a special texture. This feature allows it to swim faster and prevents microorganisms from easily attaching. Discover how scientists have turned this idea into technology!

Shark skin has inspired:

- a) Antibacterial fabrics for hospitals
- b) Solar panels
- c) Racing tires

Exactly! The microstructure of shark skin has been replicated to create antibacterial materials, used in hospitals and surfaces that stay clean without the need for chemicals.

This is an example of biomimicry: shark skin has inspired antibacterial materials and coatings that reduce the use of chemicals, helping to protect both health and the environment.

Press the space bar!

Not quite . Think: what is this texture used for in nature? It



3 GENERATIONS
FAULTY

Project Number: KA220-BW-23-30-126516

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them."





doesn't capture energy, it doesn't make cars go faster... but it keeps bacteria away!

Biomimicry in action

Nature is a great inventor. Shark skin has inspired antibacterial coatings and fabrics that reduce the use of chemicals. This is biomimicry: learning from nature to create sustainable innovations.

The whale's fins have helped improve...

- a) Video games
- b) Wind turbines
- c) Mobile phones

Exactly! ✓

The pectoral fins with tubercles (bumps)

Humpback whale fins have small bumps along the leading edge. These bumps (tubercles) reduce water resistance and increase maneuverability.

Inspiration: wind turbine blades and more efficient fans (reducing energy consumption by 20%).

Not quite, try again!

Whale songs have inspired:

- a) Electronic music
- b) Satellite technology
- c) Underwater communication systems

Not quite, try again!

The shape of a whale's body is useful to engineers because:

It's nice to look at

It reduces drag in marine vehicles

It allows flight

Resistance to deep diving

Exactly! ✓



Whales can hold their breath for a long time, efficiently redistribute oxygen, and have adaptations to withstand pressure.

Inspiration: diving suits and techniques, underwater engineering.

Not quite, try again!

Did you know that the shape of a dolphin's body inspires high-speed trains?

The body of the dolphin inspires high-speed trains because its streamlined shape reduces water resistance, allowing it to move smoothly and efficiently. Engineers apply the same principle to trains to minimize air resistance and increase speed while saving energy.

Why does the dolphin's body inspire high-speed trains?

- a) Because it's sleek
- b) Because it reduces resistance
- c) Because it is colorful

The streamlined shape of the body

Exactly!

The sleek body and smooth skin reduce resistance in the water.

Inspiration: high-speed trains (Shinkansen in Japan), more efficient ship design.

Not quite, try again!

What is echolocation?

- a) A navigation system based on sound echoes
- b) A swimming technique
- c) A way of sleeping

Echolocation (natural sonar)

Exactly!

Dolphins emit sounds and listen to the echoes to locate objects or prey.

Inspiration: sonar and radar, underwater navigation systems.



Co-funded by
the European Union

Not quite, try again!

Which invention is inspired by dolphins?

- a) The bicycle
- b) The mobile phone
- c) sonar

Advanced communication

Exactly!

They use whistles and different sounds to communicate.

Inspiration: underwater acoustic communication technologies.

Not quite, try again!

If video

-

If audio

-

If 3D model

The formats needed are:.obj,. stl.

BIO-INSPIRED AR 2.0

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



Co-funded by
the European Union



BIOS4YOU AR 2.0

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

Project Number: KA220-BW-23-30-126516

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them."

