Co-funded by
the European Union

# Designing Virus Models with Codeblocks & AR

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

"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."

KIT Karlsruher Institut für Technologie · ktu kaunas university of technology · Università degli Studi di Palermo · CEIPES · Eduact

Co-funded by
the European Union

# Table of content


**General Information** 2
**Pedagogical specifications** 3
**Technical specifications** 4

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



"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

# General Information

| | |
|---|---|
| **Name of the exercise:** | Designing Virus Structures and Types Using 3D Codeblocks & AR |
| **Description of the exercises:** | In this exercise, students design their own virus models using Tinkercad Codeblocks, learners program simple geometric shapes to build virus structures (capsid, envelope, spikes, genome). The finished models are then imported into Delightex to create an Augmented Reality experience presenting virus parts and virus types.<br><br>Students work as bio-designers, translating biological knowledge into digital 3D representations. |
| **Participants:** | Secondary school students |
| **Participants' age range:** | 14–18 years |
| **STEM subject and specific topic:** | Biology, Technology, Regenerative Medicine<br><br>Viruses (structure, parts, types) |
| **Gamification process:** | Points for correct biological representation<br><br>Badges for completed virus models<br><br>Creative bonus for clear labeling and AR presentation |
| **Written or graphic description of Augmented info:** | Students present their self-designed virus in AR, with labeled components and short explanations of each part and virus type. |
| **External (or extra) tools required** | • Smartphone, tablet, or PC with camera, Internet connection<br>• Tinkercad (Codeblocks mode)<br>• Delightex |
| **Links (video, images, text online and so on).** | • Delightex Edu platform: https://edu.delightex.com<br>• Tinkercad platforrm: http://tinkercad.com/<br>• Reference project (final example):<br><br>https://edu.delightex.com/MMU-REK |

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

"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

# 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 topic in a more interesting way for students?

Augmented Reality combined with student-created 3D models transforms the STEAM topic of viruses from an abstract and microscopic concept into a tangible, interactive learning experience. By designing virus structures using Tinkercad Codeblocks and visualizing them in AR through Delightex, students actively engage with biology, technology, engineering, and digital design simultaneously.

Instead of passively observing images or diagrams, learners become creators of scientific models. AR allows them to explore virus parts and types in three dimensions, enhancing spatial understanding and curiosity. This creative, maker-based approach increases motivation, supports inquiry-based learning, and helps students connect theoretical biological knowledge with practical digital skills.

## Which pedagogical objectives are addressed through this scenario?

- This AR-based exercise addresses the following pedagogical objectives:
- To identify and describe the main structural parts of viruses
- To distinguish between different virus types (e.g. enveloped/non-enveloped, DNA/RNA viruses)
- To understand the relationship between biological structure and function
- To develop systems thinking through modeling biological entities
- To foster creativity and problem-solving through digital making
- To enhance digital, computational, and media literacy
- To encourage inquiry-based, student-centered learning

## Which results are expected to be reached with its use?

Through the use of this exercise, students are expected to:

- Demonstrate a clearer and deeper understanding of virus structure and classification
- Accurately explain virus parts and their biological roles using their own models
- Show improved spatial and conceptual understanding of microscopic systems
- Apply biological knowledge creatively through digital modeling
- Actively participate and show increased engagement compared to traditional teaching methods
- The exercise supports both knowledge acquisition and the development of a scientific mindset.

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

"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

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

Disciplinary benefits:

- Improved comprehension of virology concepts
- Better retention of knowledge through visual and hands-on learning

Practical and sensory benefits:

- Development of spatial reasoning and visualization skills
- Experience with digital design and AR technologies

Motivational and social benefits:

- Increased student motivation and confidence
- Reduced learning stress through gamified and creative tasks
- Enhanced collaboration, discussion, and peer learning

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

"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

# 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** | Augmented Reality using Delightex (https://edu.delightex.com/Studio/Spaces) |
| **If it's needed a marker, description of the marker** | https://edu.delightex.com/MMU-REK |
| **Hardware and software needed:** | PC, smartphone or tablet with camera and internet access |
| **Type of Augmented data** | Images, text, 3D models |
| **Written description of the AR data** | Each student-created virus appears in AR. Tapping on different parts reveals short explanations describing their biological role and virus type.<br>1. Students explore the **reference AR project** to understand expectations.<br>2. In Tinkercad Codeblocks, they:<br>○ Build a virus using basic shapes<br>Represent biological parts symbolically<br>3. Models are imported into Delightex.<br>4. Students create an AR scene where: |

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

"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."

| | |
|---|---|
| | ○ Virus parts are labeled<br>○ Virus type is explained (e.g. enveloped / non-enveloped, DNA / RNA)<br>**Scope of augmented information:** 3D student-created models, Text labels, Simple AR interactions<br>**Goals achieved:**<br>● Linking structure to biological function<br>● Developing computational and systems thinking<br>● Strengthening conceptual understanding through creation |
| **If Image** | Static images are used as visual references and support materials. They include simplified diagrams of virus structures and virus types, helping students compare their self-designed models with real biological examples. Images support initial orientation and reinforce biological accuracy during the modeling process. |
| **If Text** | Text-based augmented information is used to label virus parts and explain their biological functions. Short, clear descriptions appear when students interact with different components of the 3D virus model in AR. Text supports scientific vocabulary development and reinforces structure–function relationships. |
| **If video** | Short instructional videos are used as guidance and inspiration. These videos demonstrate how to use Tinkercad Codeblocks to create basic virus structures and how to import 3D models into Delightex for AR visualization. Videos also provide brief scientific explanations of virus types and infection mechanisms. |
| **If audio** | Optional audio narration can be included to support accessibility and engagement. Audio explanations describe virus parts and types when students tap on AR elements. This feature is especially useful for learners with reading difficulties and supports multisensory learning. |
| **If 3D model** | Student-created 3D models represent virus structures and types. Using Tinkercad Codeblocks, learners design viruses from basic geometric shapes (capsid, envelope, spikes, genome). These models are imported into Delightex and visualized in Augmented Reality, allowing students to explore, label, and explain their biological meaning.<br><br>.obj, .stl (available in Delightex Edu library) |

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

"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: 2023-1-DE03-KA220-SCH-000126516

"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."