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Stem Cells in the Medical World

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

KIT Karlsruher Institut für Technologie
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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

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- Pedagogical specifications
- 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:	The MSC for the treatment of rheumatoid arthritis
Description of the exercises:	The activity uses augmented reality to bring a biology laboratory to life in order to understand the application of stem cells in the medical world. Through their mobile devices or tablets, students interact with a virtual guide — Mr. Ted the laboratory biologist — who presents them with challenges in each phase. Students must choose between multiple options, each with different biology outcomes.
Participants:	The activity is designed to be done **individually**, with optional group reflection afterward. Individual participation ensures that each student makes their own decisions throughout the experience, fostering personal curiosity. 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 The exercise assumes prior basic knowledge of environmental science. Students at this age are cognitively ready to engage in abstract thinking, ethical reasoning, and real-world problem-solving.

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STEM subject and specific topic:	The exercise addresses the challenge of making stem cells understandable. Students are often unaware of new medical experiments. Augmented reality helps simplify this aspect by showing each step in a clear and interactive way.
Gamification process:	Students navigate within the laboratory, interacting with different objects, and are faced with choices that help them understand how this system works in reality. Each decision reflects their awareness of health and biology.
Written or graphic description of Augmented info:	• Animated character (Mr. Ted) who guides students. • Information overlay: Decision prompts and visual feedback effects • Floating 3D choices: Students select correct or incorrect options by tapping icons or objects. • Static AR environments: A 3d laboratory with which interact 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.
External (or extra) tools required	Mobile device or tablet with AR capabilities. Internet connection for initial file loading. Printed AR marker sheet (optional) or screen-displayed trigger image.
Links (video, images, text online and so on).	https://www.ellenmacarthurfoundation.org/ .

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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?

Using a mobile device (tablet or phone), students will scan the QR code that will take them into the game. Once inside the laboratory, they will have to explore their surroundings to interact with augmented reality. Through interaction with the character Mr. Ted, they will learn in a fun and playful way what stem cells are and how they can be used.

Which pedagogical objectives are addressed through this scenario?

The educational objective of this game is to improve students' logical skills. In addition to acquiring new knowledge on the subject matter, students will have to figure out for themselves how to interact with the surrounding space and what order of information will be useful for completing the game.

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Which results are expected to be reached with its use?

Stem cells are a complex topic to understand when studied through books, especially since many schools do not even have chemistry laboratories, thus lacking the experiential part of knowledge. The game can improve understanding of this specific topic, improving the student's memory and learning skills, who will be more involved in the subject through the game.

Which benefits are expected to be reached with its use?

Students can improve their technical and IT skills through the use of augmented reality. By improving their proprioceptive and spatial skills when interacting with a 3D space projected into the surrounding reality. The game mode will make the educational experience more engaging and interesting, even for students with learning difficulties.

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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/WITCwZGcafwP5yq4 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	Students will begin the experience by scanning a marker or accessing an AR app on their mobile device or tablet. The AR laboratory will appear on the screen, featuring the character Mr. Ted, who will invite the student to become his assistant in developing a treatment for arthritis. One by one, students will learn how stem cells work through questions and immersive games that will lead them to explore the laboratory.

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Along the way, they can discover hidden objects to obtain information that will help them answer the questions. After completing all the tasks, students receive immediate feedback and educational information on this topic.

The activity is carried out individually, but can conclude with a class discussion or reflection to compare results and share insights.

If Image

If Text

-Let's start!

-Welcome to Mr.Ted's stem cell lab, he is a laboratory biologist who is working to create new therapies to treat the symptoms of patients suffering from chronic arthritis, precisely because of the ability of these cells to replicate and regenerate new tissue. The professor is very busy and needs your help! Today you will be his trusted assistant; talk to the professor to find out how you can be helpful to him in creating stem cell therapies. 1. When you come inside click on Mr.Ted.

MR TED: Hi, welcome to my lab! Here, we study one of science's most incredible breakthroughs: stem cells!
-**Do you know them?**
Yes or not

→if **YES** Yes good! Stem cells are special cells in the body that can divide and develop into different types of cells. They are important for growth, tissue renewal, and repair. For example, they are used in bone marrow transplants to treat blood diseases like leukemia. Today we have to treat the symptoms of a very common patology, 2. if you look at the picture you can find the correct

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disease. 3. And then go to the computer for choose the correct treatment.
→ if **NOT** Ok don't worry, we are here to learn! Stem cells are special cells in the body that can divide and develop into different types of cells. They are important for growth, tissue renewal, and repair. For example, they are used in bone marrow transplants to treat blood diseases like leukemia. Today we have to treat the symptoms of a very common patology, **2. if you look at the picture you can find the correct disease. 3. And then go to the computer for choose the correct treatment.**

Attending 5 sec → today we have to treat the symptoms of a very common patology, 4. if you look on the picture you can find the correct disease.

Picture 1 : Rheumatoid arthritis is a chronic autoimmune disease in which the immune system attacks the joints, causing pain, swelling, and stiffness. Over time, it can lead to joint damage and reduced mobility.

Picture 2: Rheumatoid arthritis more commonly affects women than men and usually develops between the ages of 30 and 60. People with a family history of the disease or certain genetic factors are at higher risk.

Picture 3: Rheumatoid arthritis more commonly affects women than men and usually develops between the ages of 30 and 60. People with a family history of the disease or certain genetic factors are at higher risk.

Picture 4: Stem cell therapy for rheumatoid arthritis uses mesenchymal stem cells to reduce inflammation and repair joint damage. This treatment is still experimental and not yet a standard therapy.

Picture 5: Stem cells can be obtained from different tissues of the human body. The main sources include bone marrow, umbilical cord blood, and adipose tissue. In some cases, embryonic tissues or stimulated peripheral blood are also used.

Picture 6: Totipotent stem cells can give rise to an entire organism, including extraembryonic structures. Pluripotent stem cells can

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	differentiate into all body cell types but cannot form a complete organism. Multipotent stem cells generate a limited range of related cell types, while unipotent stem cells can produce only one specific cell type. **Click on laptop:** Research : For the treatment of rheumatoid arthritis, stem cells are mainly divided into two categories: mesenchymal stem cells (MSCs), which are the most studied for their ability to modulate the immune system and promote tissue regeneration, and hematopoietic stem cells (HSCs), used in more severe cases to "reset" the immune system through transplantation. MSCs can be harvested from different sources such as bone marrow, adipose tissue, or umbilical cord. Recent studies also focus on induced pluripotent stem cells (iPSCs), which could offer new therapeutic possibilities. However, all these applications remain largely experimental. Dr. Mr.Ted is currently beginning stem cell division therapy and we must assist him as his assistants. **5. Click on red book for start the process.** Mr Ted: Good Job! Now we can start with the process of cellular division. 6.Click the right cells and the right ampoule for divided it. **7.Then click on the white notes.** **Click on white note: 8**. Have you finish the division process? YES or NOT **Click on the syringe: 9.** Use me to heal Luke Congratulations! You successfully helped Mr. Luke Smith by administering the stem cell treatment we worked on. While we did not cure his condition, we certainly helped relieve his symptoms. You have been an excellent assistant!
If video	-
If audio	-
If 3D model	The formats needed are:.obj,. stl.

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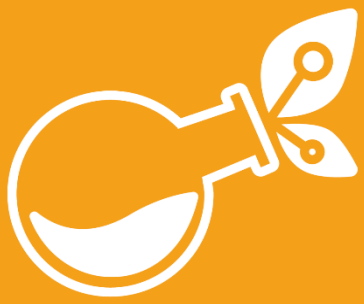

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