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IoT World Explorer



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

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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
 - Pedagogical specifications
 - Technical specifications



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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:

IoT World Explorer

Description of the exercises:

Three different scenarios in which the Internet of Things technology is used and what kind of devices to use. After exploring them, the student will be presented with a type of problem to solve, after studying the topic of the training unit.

Participants:

The exercise is designed for small collaborative teams of 3–5 students. Working in groups supports division of roles (e.g., system analyst, technician, user), encourages peer learning and reflects real-life multidisciplinary collaboration in smart environments. It can also be adapted to individual use in distance learning or self-paced exploration, although collaborative mode provides richer interactions and discussion-based problem solving.

Participants' age range:

Recommended for participants aged 16–20, particularly in:

- Technical or vocational education (e.g. IT, electronics, automation, tourism)
- High school STEM tracks
- ITS and early university courses

Basic familiarity with digital tools and interest in technology or applied science is suggested. The AR experience introduces advanced concepts in an intuitive and visual way, making them



STEM subject and
specific topic:

accessible even to those new to IoT.

Subject: Technology / Computer Science / Engineering
Topics: Internet of Things (IoT), Smart systems and automation,
Data flow and sensor networks.

Gamification
process:

Each scene addresses one context where IoT plays a key role.
The exercise simplifies the complex interconnectivity between
smart devices, sensors, data management, and decision-making
through AR experiences that make invisible processes visible
and interactive.

Gamification is based on the Adventure + Role-play model:

Each scenario is a "mission" within a different smart
environment.

Learners earn points for: Completing tasks, Solving problems
correctly, Acting quickly and efficiently, Discovering hidden
information or taking initiative.

Badges are awarded per scene (e.g., "Smart Home Hero", "Green
Farmer 4.0", "Hospitality Tech Master").

A leaderboard may be displayed in the classroom.

Written or graphic
description of
Augmented info:

External (or extra)
tools required

Smartphones or tablets with AR capability

Internet access, Printed Markers

Whiteboard or paper for team planning (optional)

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

https://www.ibm.com/think/topics/internet-of-things?mhsrc=ibmsearch_a&mhq=iot

<https://www.youtube.com/watch?v=LFkLUVjWK08>

<https://www.youtube.com/watch?v=4-eVUGHuies>



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?

STEAM subjects often involve abstract, invisible, or complex systems like sensor data, energy flows, or mechanical processes.

With AR: Students see live data (e.g. temperature, pressure, energy consumption) overlaid on physical or virtual objects.

They can explore "inside" machines or networks, understanding how components interact in real time.

Example: In the smart factory scene, AR shows how vibrations in a motor increase over time before a failure, making predictive maintenance concrete and understandable.

Which pedagogical objectives are addressed through this scenario?

This AR-based IoT scenario addresses several pedagogical objectives that span cognitive, technical, collaborative, and motivational domains. Here's a breakdown of the key learning goals aligned with educational best practices:

Understanding Real-World Applications of STEAM Concepts. Students learn how sensors, networks, and data processing are used in real environments (homes, hospitals, cities, etc.). They recognize the practical relevance of abstract concepts like automation, feedback loops, and system optimization.

As outcome, learners can describe and analyze how IoT systems work in different sectors.



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Which results are expected to be reached with its use?

Cognitive and conceptual results, students will understand how Internet of Things (IoT) systems function in diverse real-life contexts (e.g., homes, cities, factories, hotels).

They will be able to identify key components of a smart system: sensors, data flows, automation processes, and cloud connectivity.

Students will connect theory to practice, gaining a deeper understanding of STEAM topics through real-world applications.

Which benefits are expected to be reached with its use?

One of the most immediate benefits is the increase in student motivation. Because the experience is gamified and visually engaging, students are naturally more interested and curious. Learning becomes a mission, a discovery process, a challenge to be solved—rather than a chore. This heightened engagement also leads to stronger learning outcomes, as students are more focused and willing to explore difficult topics.

At the same time, the activity develops critical 21st-century skills. Students are not just absorbing information; they're solving problems, communicating with peers, making decisions based on real-time data, and using digital tools. These skills are directly transferable to modern work environments, making this type of learning particularly valuable for future careers.



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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

Assemlr world studio

<https://studio.assemlrworld.com/explore>

Marker based

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



Hardware and
software needed:

Smartphone, tablet, camera.

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Type of Augmented
data

Text; 3D models used the software provider.

Written description
of the AR data

In this AR-based activity, students explore how carbon emissions have changed over time by interacting with animated 3D globes from different historical periods.

They compare past and present data, observe the visual effects of rising CO₂, and take on a timed challenge to identify the biggest jump in emissions.

Through this playful and immersive experience, they learn key climate facts in a fun, engaging way.

If Image

-

If Text

Home Harmony

air conditioners:

IoT air conditioners connect to Wi-Fi and can be controlled remotely via smartphone apps or voice assistants. They use sensors and automation to adjust temperature, humidity, and energy consumption based on user preferences or environmental conditions. Some models integrate with smart home systems for enhanced efficiency and scheduling.

smart windows:

Smart windows and openings use IoT sensors and motors to automate opening and closing based on weather, temperature, and air quality. They can be controlled remotely via apps or voice assistants and integrate with smart home systems for energy efficiency and security. Some models include automatic shading and rain detection features.

smart lamps:

Smart bulbs connect to Wi-Fi, Bluetooth, or Zigbee and can be controlled via smartphone apps, voice assistants, or automation systems. They allow users to adjust brightness, color, and scheduling remotely. Some models integrate with smart home

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platforms for advanced automation and energy-saving features.

smart appliances:

Smart appliances connect to Wi-Fi or Bluetooth and can be controlled via smartphone apps, voice assistants, or automation systems. They offer remote monitoring, scheduling, and energy efficiency features. Some models use AI and sensors to optimize performance, detect issues, and provide maintenance alerts.

-i

Technology used: Zigbee, Z-Wave, MQTT, Home Assistant, Google Home, Alexa

AgriMind

Production Chain Monitoring:

Quality control using AI and computer vision.

Predictive Maintenance:

Sensors monitor vibrations, temperature, and energy consumption to prevent failures.

Workplace Safety:

Toxic gas sensors and wearable devices to detect incidents.

Automation

Collaborative robots (cobots) and production lines connected in real-time.

-i Technology used: LoRa, NB-IoT, AI for data analysis

Hotel Nexus

Smart kitchens:

Real-time monitoring of food and equipment stocks.

Contactless check-in:

Electronic locks and smartphone access.

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Environmental control:

Personalised lighting and air conditioning based on the guests.

-i

Technology used: IoT Cloud, BLE, RFID

If video

-

If audio

-

If 3D model

If the AR data are 3D models, the format needed is:.obj



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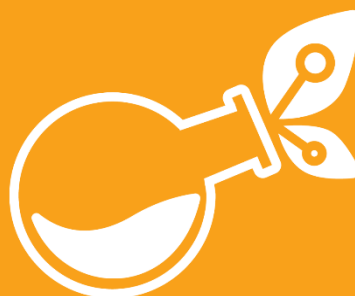


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