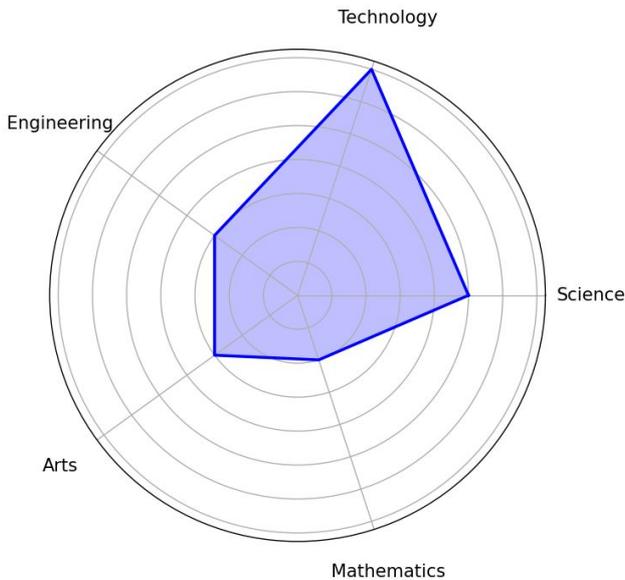




AR GYMKHANA

Duration	Age	Difficulty
90 min	11-16	Medium
#3D #CREATIVITY #DESIGNING #TECHNOLOGY		



DESCRIPTION

This activity immerses students in an interactive and exploratory STEAM gymkhana where Augmented Reality (AR) bridges the digital and physical worlds. The aim is to make learning more dynamic by using AR to reveal hidden information, visual experiments, puzzles, and challenges that promote critical thinking and cross-disciplinary application of STEAM concepts.

Summary of Key Concepts to Explore

- **Augmented Reality (AR):** Understanding the basics of how AR functions using software like Aumentaty or Vuforia.
- **Scientific Exploration:** Identifying phenomena (e.g., chemical reactions, forces, ecosystems) through AR markers.
- **Mathematical Thinking:** Solving spatial, numerical, or logical challenges embedded in AR clues.
- **Engineering & Technology:** Decoding mechanics, circuits, or processes through digital overlays and reverse design thinking.
- **Art & Creativity:** Using design-thinking to interpret visual cues and creatively solve visual puzzles.

ACTIVITY OBJECTIVES

1. **Understand the basic principles of Augmented Reality (AR):** Explore how AR works by recognizing markers and overlaying digital content on real-world images, using tools like Aumentaty or Vuforia during the gymkhana to trigger interactive clues and challenges—developing an understanding of how this technology applies to educational, industrial, and creative fields.
2. **Apply scientific and mathematical reasoning to solve real-world challenges:** Identify patterns, interpret data, and apply logic and measurement through tasks like estimating speed, calculating angles, decoding chemical processes, or predicting outcomes via AR overlays, fostering evidence-based thinking and essential problem-solving skills for academic and everyday life.
3. **Develop technological fluency and digital literacy:** Gain practical experience with mobile AR tools by downloading, configuring, and using software to interact with gymkhana markers and complete tasks, thereby preparing for responsible and informed engagement with emerging digital technologies.
4. **Use engineering design principles to analyze and respond to contextual problems:** Understand how systems—mechanical, electrical, or structural—function and can be improved by interacting with AR simulated design challenges such as fixing circuits or optimizing bridge structures, cultivating systems thinking and engineering intuition applicable in real-world contexts.
5. **Demonstrate creative thinking through artistic interpretation and visual analysis:** Engage in decoding visual puzzles and responding to design challenges using AR prompts like visual storytelling or optical illusions, enhancing creative confidence and promoting interdisciplinary thinking between the Arts and STEM.
6. **Collaborate in teams to complete an interdisciplinary mission:** Work within small groups, rotating roles and combining perspectives to solve complex challenges, there by practicing teamwork,





Expected Outcomes by the end of the session

- Have actively participated in a collaborative, problem-solving experience across multiple STEAM disciplines.
- Understand how AR technology works and how it can be used in educational and real-world contexts.
- Improve their Scientific reasoning, technological literacy, spatial-mathematical logic, and creative thinking skills.
- Produce one or more solutions to challenges based on data and AR-enhanced clues, demonstrating integrated STEAM understanding.

KEY COMPETENCES (EU)

- Digital competence
- Social and civic competence
- Cultural awareness and expression
- Competence to learn how to learn

MATERIALS



Smartphones or tablets with camera and internet



Basic school supplies



Headphones

- Provided by students
- Provided by the teacher/institution
- Downloadable Elements



Printed gymkhana cards with AR markers (pre-designed or created using Aumentaty/Vuforia)



Posters or objects to serve as AR triggers (e.g., printed models of molecules, geometrical shapes, engineering diagrams).



Internet router or hotspot for stable Wi-Fi during the activity



Tablets or smartphones (at least one per group if students don't have personal devices)



Optional: Smart glasses (if available) for immersive AR interaction



Physical tokens or rewards for completing each stage of the gymkhana.



User Guide for installing and using the AR viewer.



Activity Worksheet: Digital or printable form for logging observations, solving puzzles, and noting data.



AR Marker Templates: PDFs or image files that serve as the visual triggers for AR experiences.



AR App (free download)



Aumentaty Viewer (from official site or app stores).

Alternative: Vuforia sample viewer or other compatible AR viewer.



PREVIOUS PREPARATION

- **Team Organization:** Students are grouped into diverse teams of 3–5 members, each rotating through roles such as Navigator, Tech Handler, Recorder, and Presenter to promote collaboration and skill-sharing.
- **Equipment and Software Setup:** Devices should be fully charged, connected to the internet, and pre-installed with an AR viewer app. A quick test ensures the AR markers are recognized correctly.
- **Preparation of Printed Materials:** Print essential resources ahead of time: station cards with AR markers, worksheets, solution templates, and a teacher’s guide. Optional materials like posters or 3D props can enhance the experience.
- **Optional Digital Resources:** Prepare digital formats of all materials for use on tablets or smart boards as an alternative or complement to printed versions.
- **Introduction to the Gymkhana Theme:** Introduce how AR blends digital and physical worlds, its applications in real life, and demonstrate simple AR examples to spark student curiosity.
- **Real-World Connection and Challenge Overview:** Connect the gymkhana to global innovations in science and tech and explain how students will solve visual and interactive AR puzzles using teamwork.

CONTEXTUALIZATION AND ADAPTATION

Augmented Reality (AR) is rapidly transforming education, engineering, healthcare, architecture, tourism, and entertainment. This activity gives students hands-on experience with AR—an emerging technology that merges digital and physical worlds in real-time. By engaging in a STEAM gymkhana, they don’t just learn about science, math, or art—they explore how these disciplines intersect through technology to solve real-world problems. The gymkhana fosters curiosity, teamwork, and innovation while introducing students to tools they may encounter in future careers.

Real-world examples

- **In museums,** AR is used to animate exhibits, showing dinosaurs in motion or rebuilding ancient ruins on a visitor’s screen.
- **In construction and design,** engineers use AR to overlay blueprints onto physical sites for precision work.
- **In medical fields,** AR allows surgeons to see real-time 3D overlays of organs during operations.
- **In urban planning,** cities use AR apps to show projected developments, like buildings or green spaces.
- **In environmental education,** AR helps students visualize invisible forces—like air pollution or ecosystems.



Classroom activity

How does AR change the way we understand and explore the world?

- Can you think of a problem in your community that could be better understood or solved with the help of AR?
- What STEAM fields do you think benefit the most from AR technology? Why?
- How would you design your own AR experience to teach something in science or math?
- What are the limitations of AR? Are there any risks or challenges involved?
- How does the use of digital tools like AR make learning more inclusive or accessible?

Note for the teacher - Interesting facts

Augmented Reality (AR): More Than Just Gaming: AR is already part of everyday life—from Pokémon GO and Snapchat filters to surgery simulators and industrial training. In education, studies show that AR can boost memory retention by up to 70%, because it turns abstract ideas into visible, interactive experiences.

Science & Technology: Learning Like a Future Innovator: Using AR, students can simulate complex experiments safely and instantly—like chemical reactions or gravity simulations—without lab risks or expensive equipment. NASA and engineering teams use similar AR tools to test systems in virtual environments before building real prototypes.

Art & Creativity - Not Just Decoration, But Innovation: The design thinking and visual puzzle solving used in this activity mirror real-world UX/UI design, used in apps, websites, and video games. Artistic thinking is vital in STEAM: the world's most innovative engineers and scientists (like Leonardo da Vinci or Mae Jemison) were also artists or musicians.

Mathematics in the Real World: From angles and geometry in architecture to logic puzzles in programming, the math in this activity helps students realize: “I’m already using math like an engineer!”. AR even helps architects and builders visualize structures before they’re built, reducing design errors and saving time and money.

Why It Matters for Their Future: The global AR market is expected to reach \$88 billion by 2030— and today’s students will build that future. Employers now look for people who can combine technical skills with creativity and collaboration—exactly what this gymkhana trains.



ACTIVITY

Forming groups (10 min)

1. Divide the class into small teams of 3–5 students to encourage collaboration and active participation.
2. Assign team roles (e.g., navigator, tech handler, recorder, presenter) to ensure balanced engagement.

Setting up equipment or software (15-20 minutes)

- Ensure all devices (smartphones/tablets) are charged and have the AR app (Aumentaty Viewer or Vuforia-based app) pre-installed.
- Test AR content on each device in advance to avoid compatibility issues.
- If smart glasses are used, check Wi-Fi connectivity and compatibility with the AR platform.

Printing materials (30-45 minutes)

- Print the AR marker gymkhana cards and prepare them to be placed at various **activity stations**. These stations can be set up in any **environment**—whether indoors or outdoors, including public spaces, parks, city centers, schoolyards, or rural locations.
- The design should allow flexibility so that the activity can be implemented in **any country** or setting (e.g., Spain, France, etc.).
- Ensure that each AR marker is securely attached and protected from weather if used outside.
- Prepare any additional physical models or props to be used as visual anchors for AR triggers, adapted to the chosen environment.

Reviewing prior resources (10-15 minutes)

- Distribute the student worksheet ahead of time to introduce the structure of the activity.
- Share a brief tutorial video or conduct a live demo on how AR works and how to interact with digital content.
- Review basic concepts from the disciplines involved (e.g., geometry, energy, circuits, or data tables) if needed as a refresher.



Prepare a Brief Introductory Talk (5-10 minutes)

- Plan a short presentation (5–10 minutes) to introduce students to AR technology, its real-world applications, and the purpose of the gymkhana.

STATION ACTIVITIES

This is an idea or approximation of what we could do in the stations related to each subject.

Station 1 – Science Challenge: Observe and Hypothesize

- **AR Content:** Scan to see an animation of a biological or physical process (e.g., plant growth under different light types).
- **Task:** Observe what’s happening and discuss the reason behind the changes. Use observation skills to hypothesize real-world implications (e.g., why sunlight affects plant behavior).

Station 2 – Technology Puzzle: Fix the Circuit

- **AR Content:** View a broken circuit board with missing or swapped elements.
- **Task:** Drag virtual components (resistors, LEDs, wires) into place to repair the system visually. No physical components or calculations required—just logic and structure understanding.

Station 3 – Engineering Build: Assemble the Smart House

- **AR Content:** Scan to access an **empty house base** and see AR furniture and walls appear as pieces on a second layer.
- **Task:** Students drag and drop the walls, doors, roof, and furniture to **recreate a fully functional house** based on the visual clues. Focuses on spatial thinking and design—no math needed.

Station 4 – Art Illusion: Find the Hidden Image

- **AR Content:** View two abstract or incomplete 3D figures.
- **Task:** Move around and view from different angles until they align into one meaningful shape (e.g., a tree, a face, or an animal). Encourages visual intelligence and interpretation.

Station 5 – Mathematics Visualizer: Shape Logic

- **AR Content:** See a base 3D geometric structure (like a pyramid or cube).
- **Task:** From a digital toolbox, drag and drop new shapes (e.g., spheres, prisms) into correct positions to solve a spatial puzzle—like creating a structure that matches a target silhouette. Emphasizes geometry and pattern recognition, not arithmetic.



CONCLUSION AND SHARING



After completing the gymkhana stations, it's time for students to share their findings and experiences with the rest of the class. Encourage them to reflect on their design and teamwork using the following prompts:

- **Explain their design and problem-solving decisions:**

- What choices did they make at each AR station?
- Why did they place elements where they did (e.g., building the house layout, selecting shapes in geometry tasks)?

- **Describe their AR interactions:**

- Which AR elements helped them the most?
- Were there any clues that were difficult to interpret?

- **Compare their responses with real-world examples:**

- In the **engineering house station**, could their structure model relate to smart home layouts or real architecture?
- In the **technology station**, how might real technicians or engineers fix a circuit based on similar visual diagnostics?

- **Discuss societal relevance:**

- How could AR technologies like the ones they used be helpful in real life?
- In what areas (e.g., education, medicine, design) do they see potential uses?

Debate

- What was the biggest challenge you faced during the gymkhana?
- How did using Augmented Reality change the way you understand science, art, or technology? • What part of the activity did you enjoy the most and why?
- If you had more time, what would you change or improve about your team's approach? Can you imagine using AR to solve a real-world problem?
- Have you ever seen or used AR outside of school?
- Do you think your team's final product or ideas could be used in real life? How?
- Did anything surprise you about how art and science worked together in the activity?



IDEAS FOR EXTENSION

- **Design Your Own AR Puzzle**
 - Students create a visual logic or perspective-based puzzle using drawings or digital tools, then turn it into an AR marker with hidden clues.
- **Build a Virtual STEAM Museum**
 - Collaboratively design a digital museum with AR exhibits representing each STEAM field—one for science experiments, one for art illusions, etc.
- **Create a City of the Future with AR**
 - Teams design futuristic city blocks integrating sustainable tech, smart homes, and interactive art, using AR to visualize each concept in real space.
- **AR for Accessibility**
 - Prototype an AR concept that supports people with disabilities—like translating signs into audio or highlighting safe paths in a school building.

Don't forget to take a photo of your experience and share it with us!



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[Instagram](#)



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[Articles | Common Sense Education](#)

- Easy-to-understand overview of AR and its use in education and daily life.

2. Vuforia Developer Portal

[Home | Engine Developer Portal](#)

- Learn how AR markers work and experiment with creating your own interactive scenes.

3. Tinkercad (3D Design and Electronics Platform)

<https://www.tinkercad.com/>

- Build simple circuits, 3D models, or prototypes digitally—great for engineering and design extensions.

4. NASA AR and VR Projects for Students

<https://www.nasa.gov/stem/at-home-for-students-k-4.html>

- Explore space science and simulations using AR/VR technology from a trusted scientific source.

