INNOVATION AT PLAY

CLASSROOM ACTIVITY

VIRTUAL GRAVITY

Have you ever imagined what it would be like to walk on the Moon or to experience the intense gravity of Jupiter?

In this activity, you and a teammate will design your own simulation that recreates the gravity of different places in outer space for an out-of-this-world mixed reality experience!

STEP 1: CONNECT

Find a teammate and discuss what you both know about gravity in other parts of our solar system. How is it different to what we experience on Earth?

STEP 2: INVESTIGATE

First, read about Newton's Law of Universal Gravitation: tinyurl.com/newtonlawgravitation. This law can be used to help calculate the gravitational force on *any* planet!

Next, select three other planets or celestial bodies on which to focus. Use the internet and Newton's Law of Universal Gravitation to understand how gravity works on each one.

Tip: *NASA's online resources may be a good place to start.*

As you learn about gravity on each planet, compare it to what you experience on Earth.

STEP 3: DISCUSS

Learn: Mixed reality headsets blend digital and real-world elements for a dual interactive experience. They use magnetometers for precise movement tracking and radio waves to connect with other gadgets. Built-in artificial neural networks make the virtual elements respond more naturally to your actions, offering an immersive experience.

Talk it through: Think about what you learned about gravity above. In what circumstances may mixed reality be used to simulate these environments?

Learn: There are a variety of situations where mixed reality may be used to simulate the gravity of different environments. Some of these situations include:

- **Training and Research:** Mixed reality is used during astronaut training to simulate tasks under different gravitational conditions, preparing astronauts for real space missions.
- **Education:** In educational settings, mixed reality can be used as an interactive tool to help students experience and understand the effects of varying gravitational forces on different celestial bodies.
- **Scientific Simulations:** Researchers utilize mixed reality to test how equipment like rovers and landers would operate in the gravitational conditions of other planets or moons.
- **Entertainment:** Mixed reality offers a unique entertainment experience by enabling users to virtually explore the differing gravitational environments of celestial bodies like the Moon or Mars.

Talk it through: What are the advantages to using mixed reality in the situations described above?

STEP 4: MATERIALS

Try to design a mixed reality experience that simulates gravity on a celestial body of your choice.

You will need:

- Device with internet access
- Device with recording capabilities
- Paper and drawing supplies or a digital storyboard program (such as StoryboardThat)

STEP 5: THE CHALLENGE

Each pair's challenge is to design a mixed reality experience that simulates the gravity of a selected planet or moon. Be sure to consider the location's specific gravitational force, as well as how it varies from Earth's gravity.

Think about who the mixed reality experience will be intended for and where it will be used. Then, create a storyboard (digital or paper) that outlines the gravity simulation. Pretend that designers will use this storyboard to create the actual experience. In your storyboard, consider how physical sensations, visual effects, and user interactions can make the simulation as life-like as possible.

STORYBOARDS, EXPLAINED

A storyboard serves as a visual guide that maps out the sequence of user interactions and digital elements in a mixed reality experience, helping designers plan how users will navigate and engage with both the virtual and real-world components.

STEP 6: SHARE

Create a video that presents the mixed reality experience that you designed and explains how it could be used to teach people about gravitational forces.

Post your video with the hashtags #InnovationAtPlay and #VirtualGravityLab so others can learn from it, too!

NGSS STANDARDS

- HS-PS2-4: Use mathematical representations of Newton's Law of Universal Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

COMMON CORE ELA STANDARDS

- CCSS.ELA-LITERACY.CCRA.SL.4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.