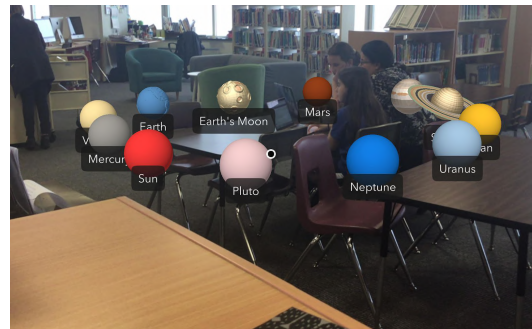# Solar System Gravity Lesson plan

Created by Clint Carlson

Education level: From high school

Subject: STEAM, mathematics, physics, natural science, astronomy

Format: Individual activity

Duration: Approx. 1 hour

Introduction and lesson objectives:

Letting your students build their own 3D creations with CoSpaces Edu is a great way for them to develop their spatial skills, imagination, and get familiar with using the building blocks in CoSpaces Edu.

This project will allow your students to simulate how a ball would fall on planets / moons with different gravity forces as an Augmented Reality solar system in your classroom!

Learning goals and student benefits:

- Learn 3D creation skills
- Develop spatial thinking skills
- Practice computational thinking
- Learn coding with physics
- Research gravity forces in space
- Demonstrate learnings

Activity example:

1. Have your students do some basic CoBlocks programming such as animating a character to rotate in place.
2. Have students use the Physics properties in CoSpaces Edu Pro to see the default state of objects falling with simulated Earth gravity.
3. Have students research how fast objects fall on other planets. By documenting how fast objects fall per second on different planets, your students will have the information they need to simulate gravity in other places.
4. Let your students create their solar system gravity simulation following the creation guide on the next pages.

Extension idea:

Ask your students to present their solar systems to the class and discuss what can be observed in the simulation.

Assessment and evaluation suggestions:

- Have your students managed to create their solar system in CoSpaces Edu?
- Did your students conduct successful research that was used to create their solar systems? Do these demonstrate their learnings?
- Have your students managed to use Physics properties?
- Have your students managed to code with CoBlocks?

Creation guide
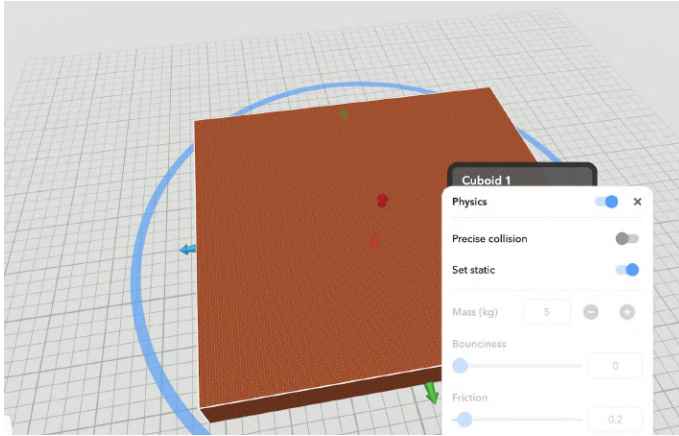
Begin by creating a floor shape (Library > Building) so your planets have something to bounce off of.

Double or right-click it to activate Physics on this ground object and turn it to Set static.

Your planets will bounce off of this ground at the same rate a ball would fall on that same planet!

Now start placing the planets of your solar system. You can use the Ellipsoid under the Building category in the Library and give each sphere a color.

Or spruce it up in Upload > 3D models > Web search to find existing 3D models of our various planets/moons.
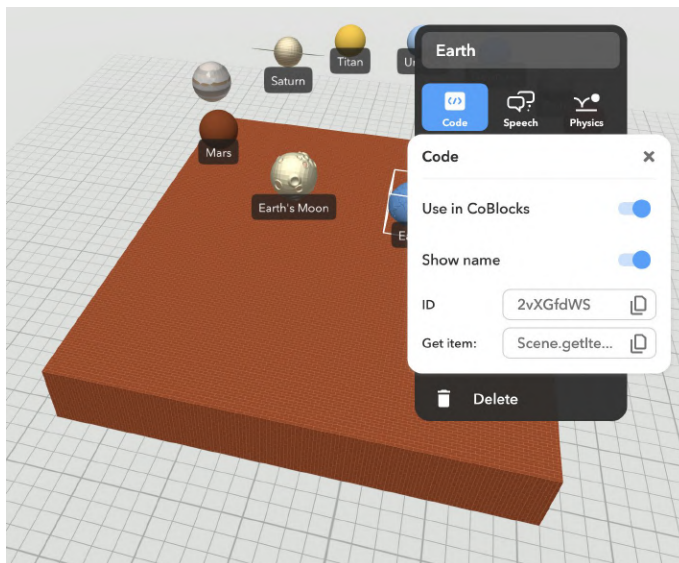
Drag each shape or 3D model onto your scene and place them above the static ground you created.

Give each object a **name**.

Double click each planet/moon and select Code. Toggle Use in CoBlocks to be able to program these and Show name to make it clear which planet you're interacting with at a time.

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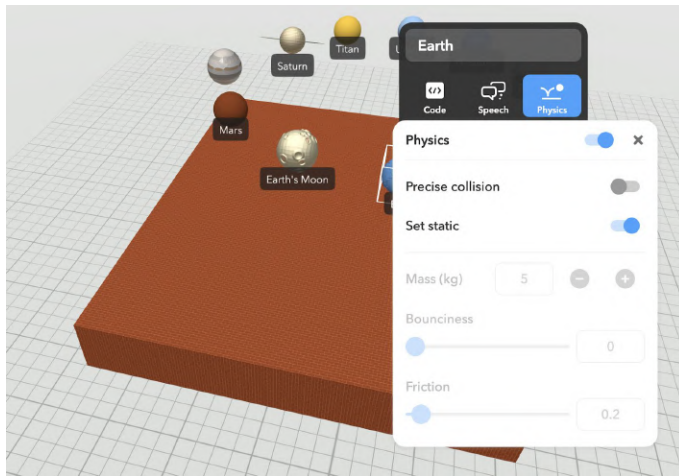
Also, activate Physics for each planet/moon and Set static so that they stay in the air waiting to click over them to trigger their actions.

Now for a bit of programming! This is where you insert the **"rate of fall"** that was researched for each planet/moon. Set gravity pull uses how many meters an object falls per second.

Example: An object on earth falls at 9.8 meters per second.
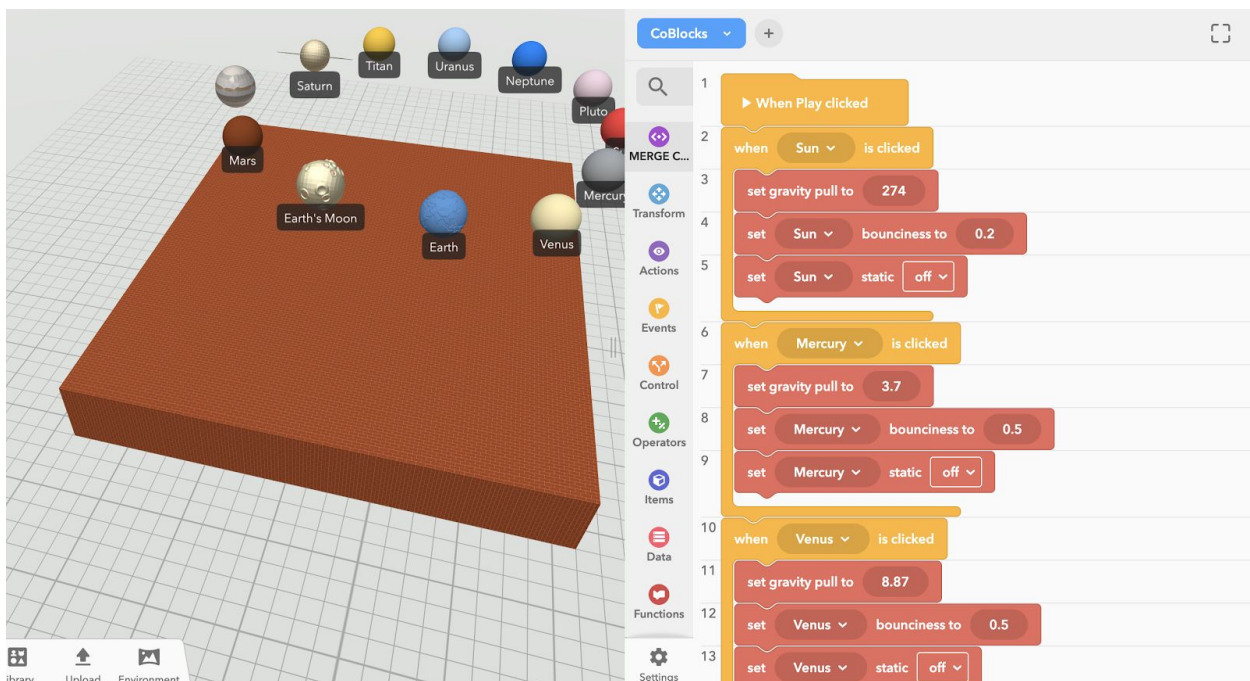
Open **CoBlocks** and create the following code for each object:

- **When** "planet/moon" **is clicked**
- **Set gravity pull** to (the meters per second objects fall on the planet you've researched)
- **Set** "planet/moon" **bounciness** to 0.5
- **Set** "planet/moon" **static** to "off". This releases the object to fall after you've set its gravitational pull.

Examples:

- **When** "Earth" **is clicked**
- **Set gravity pull** to "9.8"
- **Set** "Earth" **bounciness** to 0.5
- **Set** "Earth" **static** to "off"
- **When** "Mercury" **is clicked**
- **Set gravity pull** to "3.7"
- **Set** "Earth" **bounciness** to 0.5
- **Set** "Earth" **static** to "off"

You're now ready to view your project in VR, AR or even on a MERGE Cube!

You may like to add a dark environment for VR or just have the planets float and drop in your classroom.

By clicking each planet/moon, you'll activate their gravity and they'll fall to the ground as if they were a ball on that planet!

Example CoSpace

Solar System Gravity Simulation

edu.cospaces.io/MMZ-HHM