Logo

Description automatically generatedKolbe Catholic College

Year 7 Science

Investigation

Earth and Space Science

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Access the PhET app, or visit <https://phet.colorado.edu/en/simulation/gravity-and-orbits>

Once you open it, you will see two tabs at the top; ‘cartoon’ and ‘to scale’ in which you can view the simulation.

‘Cartoon’ shows the Sun, Earth and Moon with distances exaggerated so it is easier to visualise.

‘To scale’ shows the relative size and distances of the Earth, Sun and Moon. While for most of this activity we’ll be using the ‘Cartoon’ tab so we can see what is happening easier, it is good to switch back to the ‘to scale’ just to have a more accurate perspective of what is going on.

Spend the first 5 – 10 minutes just exploring the simulation selecting the Earth, Moon and Sun or various combinations of those and then running the simulation.

You should also try showing the gravity force, velocity (similar to speed but showing the direction it is moving in) and path.

You are also able to vary the size of the Sun and planet to see how this affects its path.

After becoming familiar with the controls and what they do, choose the ‘Cartoon’ tab and then click reset all. You should then work systematically through these steps to more about the cause of the motion of the Earth, Moon and Sun.

**Guided investigation using the simulation**

1. Select the Earth and Sun only and then choose to show the path and press play. Describe the path.

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1. Select ‘Gravity force’ as it moves. Why are two force arrows shown?

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1. What do you notice about the size of each of the force arrows?

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1. In which direction does the force arrow on the Earth always point?

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1. If this was the only thing occurring then the Earth and Sun should just be attracted toward each other and collide. Another factor influences the Earth’s motion. Select ‘velocity’ to show the direction of the Earth’s velocity (speed) as it orbits. What do you notice about the direction of the velocity compared to the gravitational force?

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1. Select to turn the gravity off. This shows how the Earth would move if there was no influence of gravity due to the Sun. What do you notice about the path from when you turned gravity off?

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1. Turn gravity back on and then click ‘reset’. Increase the mass of the Sun a lot using ‘Star’ sliding scale. What do you notice about the path the Earth would take if the Sun’s mass was much larger? Suggest a reason for this.

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1. Write a brief summary of your findings bout gravitational force and the planet’s velocity from this investigation. You may like to use diagrams to help you.

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**Using the simulation, you area to undertake an investigation in pairs or threes of either:**

* The Earth and the Moon
* The Earth, Moon and Sun *(challenging)*

**Your group should discuss:**

* Which investigation you choose to undertake?
* What you’d like to find out about those objects in terms of force and velocity.
* How you intend to do this in a systematic way similar to the one performed before with the Earth and the Sun.
* How you intend to present a summary of your findings eg. Visually, written, audio, or a combination of these.

Marking guide

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | A | B | C | D |
| Earth and Space Science | Explain how the positions of the Earth, sun and moon can be used to predict phenomena on Earth | Explains how to the positions of the Earth, sun and moon affect the phenomena | Describes how the positions of the Earth, sun and moon affect phenomena of Earth. | Identifies that the Earth, sun and moon are involved with phenomena on Earth. |
|  |  |  |  |  |
| Science Inquiry Skills | Comprehensively communicates ideas, methods and findings in detail using scientific language and appropriate representations. | Communicates their ideas, methods and findings in detail using scientific language and appropriate representations. | Communicates their ideas, methods and findings using some scientific language and appropriate representations. | Communicates their ideas, methods and findings using everyday language and simple representation. Responses are often incomplete or irrelevant. |
| Summarises and clearly presents data in a range of appropriate representations, explains patterns and trends linking to relevant scientific knowledge and uses evidence to support conclusions. | Summarises and represents data in a range of appropriate representations, explains patterns and trends and uses evidence to support conclusions. | Summarises and presents data using appropriate representations, describes trends and uses evidence to support conclusions | Summarises and presents some data using appropriate representation and draws general conclusions. |