Science 3-5: Defying Gravity

Intended Audience: Students with significant cognitive disabilities

# **Standards:**

SC.3.E.5.4 Explore the Law of Gravity by demonstrating that gravity is a force that can be overcome.

SC.3.N.1.2 Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.

SC.3.N.1.3 Keep records as appropriate, such as pictorial, written, or simple charts or graphs, of investigations conducted.

SC.4.P.8.1 Measure and compare objects and materials based on their physical properties including mass, shape, volume, color, hardness, texture, odor, taste, and attraction to magnets.

SC.4.P.8.4 Investigate and describe that magnets can attract magnetic materials and attract and repel other magnets.

SC.4.N.1.2 Compare the observations made by different groups using multiple tools and seek reasons to explain the differences across groups.

SC.4.N.1.6 Keep records that describe observations made, carefully distinguishing actual observations from ideas and inferences about the observations.

SC.5.P.13.1 Identify familiar forces that cause objects to move, such as pushed or pulls, including gravity acting on falling objects.

SC.5.N.1.3 Recognize and explain the need for repeated experimental trials.

# **Learning Objectives:**

1. Students can explain why objects fall to the Earth when they are dropped.

2. Students can explain how 2 objects are forced towards each other.

3. Students can demonstrate that an object can be pushed or pulled when gravity affects that object.

# **Vocabulary:**

1. gravity: a force that tried to pull two objects toward each another

2. force: physical strength or power

3. bounce: to spring back up

4. moon: an object that circles around a planet

5. object: anything that has shape or form and can be seen or touched

6. motion: the process of moving

# Materials:

* Video: [Explanation for Gravity](http://fairfieldschools.org/schools/jen/activity/grade-4-force-and-motion/) (excerpt 0:45-1:47)
* Article: [What is Gravity?](https://www.readworks.org/article/What-Is-Gravity/272c9881-42d5-4a05-9687-d246e80a8fa1#!articleTab:content/)
* Gather prior to instruction: Large beach ball
* Gather prior to exploration: ruler, 10 square cubes, 3 metal paperclips, 3 heavy magnets, tape, dowel rod or stick, string
* Science journals

# **Essential/Guiding Questions:**

1. Why do objects fall to the ground?

2. What are the effects of pushing or pulling an object?

# Lesson Presentation:

**Activating Prior Knowledge:**

1. Have students sit in a circle. Toss a large ball around the circle and ask students how the ball is staying in the air. Allow the ball to fall and to be caught. Review that tossing and catching a ball is “push and pull”.

2. Tell students that they are going to explore why most objects fall to the ground, but some do not.

**Modeled instruction:**

1. Show the video, [Explanation for Gravity](http://fairfieldschools.org/schools/jen/activity/grade-4-force-and-motion/) (excerpt 0:45-1:47). Ask students “How is the rock in the video like the ball that we just passed in our circle?”

2. Introduce the vocabulary in the video as it relates to the investigation. Use visuals supports as needed.

3. Introduce the article, [What is Gravity?](https://www.readworks.org/article/What-Is-Gravity/272c9881-42d5-4a05-9687-d246e80a8fa1#!articleTab:content/) Display the article on the Smartboard or doc camera.

4. Introduce vocabulary from the article, using visual supports as necessary.

5. Show students the materials that will be used in the investigation of gravity. Determine prior knowledge of magnetism; teach or reteach as necessary.

6. Tell students that they will be doing an investigation to see how the position of a dowel/stick and gravity affect the movement of magnets. On the Smart Board or doc camera write the Question of Inquiry: “How does the position of the dowel/stick affect the movement of the magnets?”

**Supported/Guided instruction:**

1. Re-read the article, [What is Gravity?](https://www.readworks.org/article/What-Is-Gravity/272c9881-42d5-4a05-9687-d246e80a8fa1#!articleTab:content/). If appropriate, provide students with a copy. Identify the main idea and underline it: identify key details and circle them. Discuss application to classroom and home; check for comprehension and encourage students’ discussion.

2. Tell students that they’ll be investigating the effect of magnets and gravity on a classroom object (paperclip). Investigation may be found at [Paper Clips and Gravity Exploration](https://buggyandbuddy.com/gravity/). Alternate investigations using slightly different materials may be found in the Additional Resources section below. (If using alternate investigations, adjust the Question of Inquiry.)

3. Engage students in the investigation as indicated. Consider the Essential Questions and Question of Inquiry.

**Independent Work:**

1. Display the Question of Inquiry: “How does the position of the dowel/stick affect the movement of the magnets?” This may also be printed and distributed to students to glue in to their Science journals.

2. Students will answer the Inquiry Question in their journals or discuss with a partner or in a small group.

**Small group suggestions:**

1. Students can explore additional investigations at the website, [Gravity and Magnets](http://www.capat.org/engpaperclip.htm).

2. Students can sort objects in to categories: those that are magnetic and those that are not.

3. Students can compare the physical properties of other objects and investigate their attraction to magnets.

# Assessment:

1. Students will show and explain how gravity affects objects.

2. Teachers should utilize district created rubrics to score student work.

# UDL:

**Multiple means of representation:**

1. Students can use a graphic organizer to show the way gravity reacts to magnetic and non-magnetic objects.

2. Students can write a song about their investigation.

3. Students can write additional journal entries about their investigation.

4. Students can draw pictures to show what they experienced.

5. Students can work individually, in pairs, or in a small group.

6. Students can work independently with adult supports.

**Multiple means of expression:**

1. Students can use an iPad or other touch device to show similarities and differences.

2. Text to speech options are available for computers, iPads and other hand held devices. Google Chrome offers free extensions, such as Selection Reader and Select and Speak-Text to Speech, and apps, such as Text to Speech, Text to Speech with Google Drive, and TTS Reader- Unlimited Text-to-Speech.

3. Speech to text options are also available from Google. Extensions include Voice Note II-Speech to Text, Online speech recognition, and Co: Writer Universal. Voice Note II is also available as an app; Speech notes-Speech to Text Notepad is available as well.

4. Additional information about text to speech and speech to text options are available through your district Assistive Technology Department.

5. Expression may come in the form of verbal responses, signed responses, pointing/gestures, eye gaze, or through the use of a low or high tech device.

6. All students should have access to expressive language/technology that is appropriate for their specific need.

**Multiple means of engagement:**

1. Provide students with choices of how to interact with materials.

2. Provide students or small groups with various places in the classroom in which to work, i.e. floor, desks, at the board.

3. Limit distractions in the work areas.

4. Encourage collaboration with peers in partners or small groups.

5. Allow students to work independently.

6. Allow students to be positioned for maximum learning engagement.

7. Provide students with additional materials, if necessary.

8. Provide supervision to students who need assistance when handling hard, and potentially dangerous, objects.

# Assistive Technology Recommendations:

1. All students should have a means of expressive communication and a way to be actively engaged in learning.

2. Response modes may include, but are not limited to: eye gaze, gesturing or pointing to pictures/words/phrases, signing, low tech devices (Go Talks, etc.), or dynamic devices (iPad, etc.)

3. Lesson vocabulary, photos/pictures and graphic representations should be created and/or printed prior to the lesson to provide all students with an opportunity to be engaged in discussion.

# Technology Needed:

* Smartboard, iPad

# Additional Resources:

* Website for further exploration of gravity: [Gravity Activity](http://www.primaryscience.ie/media/pdfs/col/gravity_activity.pdf)
* Alternate investigation: [Floating Pin](https://www.youtube.com/watch?v=T0q-kzAD4IM)
* Alternate investigation: [The Floating Paper Clip](https://www.youtube.com/watch?v=8TR4Qr9DxfQ)
* Alternate investigation: [Science Sparks: How to Defy Gravity](http://www.science-sparks.com/how-to-defy-gravity/)
* Article: [What is Gravity Really?](https://www.readworks.org/article/What-Is-Gravity-Really/65934b7a-6082-4502-bd23-fadf697c3cb4#!articleTab:content/)

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