

What Goes Up Must Come Down?

Lesson Plan

Michigan Curriculum Connections

SCI.I.1.E.1 – Generate questions about the world based on observation.

SCI.I.1.E.2 – Develop solutions to problems through reasoning, observations, and investigations.

SCI.I.1.E.3 – Manipulate simple devices to make measurements or scientific investigations.

SCI.I.1.E.3 – Develop strategies and skills for information gathering and problem solving.

SCI.I.1.M.2 – Generate scientific questions about the world based on observation.

SCI.I.1.M.3 – Use tools and equipment appropriate to scientific investigations.

SCI.I.1.M.5 – Use sources of information in support of scientific investigations.

SCI.II.1.E.1 – Develop awareness of the need for evidence in making decisions scientifically.

SCI.II.1.M.1 – Evaluate the strengths and weaknesses of claims, arguments, or data.

SCI.II.1.M.2 – Describe limitations in personal knowledge.

SCI.IV.3.E.1 – Describe or compare motions of common objects in terms of speed or direction.

SCI.IV.3.E.2 – Explain how forces (pushes or pulls) are needed to speed, slow down, stop, or change the direction of a moving object.

SCI.IV.3.E.5 – Manipulate simple mechanical devices and explain how their parts work together.

SCI.IV.3.MS.1 – Qualitatively describe and compare motion in two dimensions.

SCI.IV.3.MS.2 – Relate motion of objects to unbalanced forces in two dimensions.

SCI.IV.3.MS.3 – Describe the non-contact forces exerted by gravity.

Time required

Two 45-minute to 1-hour class periods

Classroom materials needed

- Pilot Logs
- Plastic straw for each student
- 1 ball of kite string or twine
- 60 plastic washers

Intrigue

- Prior to visiting the Air Zoo, visit www.airzoo.org and preview the exhibit with students. Review what your expectations are while visiting the museum.
- Distribute Pilot Logs and pencils and use them for taking notes, drawings, and diagrams.
- After entering the exhibit area, have students sit under the SR71 Blackbird wing. Students should be seated on the floor, not the platform. Ask children to focus on the following quote:

“The airplane stays up because it doesn’t have time to fall.” *Orville Wright*

- Ask the students these questions:

What do you think of this quote?

What do you think keeps an airplane up in the sky?

What force or forces would make it fall?

- Direct students to write their ideas in their Pilot Logs while leaving space to draw and take notes while touring the exhibit. They will revisit these questions as they leave the Air Zoo.

- Have students share ideas with their neighbor and compare. Identify any misconceptions, beliefs, or understandings they may have in order to address questions later on.

Illustrate

- After leaving the museum, have students refer to their Pilot Log and revisit the quote and questions. Students should express that motors, wind, and air keep the airplane up and gravity would make it fall. If gravity is not given as an answer, then check students understanding of the concept of gravity and falling. To demonstrate the force of gravity, simply drop a pencil and ask why it fell down and not up.
- Explain that gravity pulls objects downward, toward the center of the Earth. It pulls all objects downward at the same rate, regardless of size or mass. On the moon, an object has the same mass as on Earth, but it weighs less because the moon's gravitational pull is not as great as the Earth's.
- Ask the children how the moon, stars, and even the International Space Station stay in their orbits. Remind the students that gravity helps to keep things in order in space too. As a human-built satellite circles the Earth, Earth's gravity keeps the satellite from flying off into space. After an initial push from a rocket gets the satellite into space, the satellite's orbital speed keeps it in space. At the same time, gravity constantly pulls at the satellite and keeps it going around the Earth. There is a certain orbital speed it must maintain, otherwise the satellite will be pulled closer to Earth.

Finalize

- Class demonstration: drop a book. Ask the students what happened. They should refer to gravity. Now, hold a book in one hand and a pencil in the other. Ask the students

to predict which will hit the floor first. Drop both objects at the same time. (This may take practice.) Ask which one hit the floor first and why.

- Next have each child run a length of string (about 3 ft) through a straw and tie a lightweight plastic washer to each end. Make certain the string is securely fastened to the weight. (The objects could be dangerous if they fly off.)
- The upper weight represents the satellite and the lower weight represents gravity. Hold straw in hand and rotate the wrist. This will spin the satellite around. Does the lower object rise up toward the straw or other spinning weight? Can you spin the satellite so the lower object remains level and does not move up and down? It takes practice. To maintain an "orbit" the outward pull caused by the rotation of the satellite must be balance by the pull of gravity.
- Does the satellite have to go faster or slower for the lower object to remain level? Ask the students why.

Assess

- Return to the original quote.
- Ask students to write their response to this quote using four examples from either the exhibit at the Air Zoo or the classroom activity to support their answer.
- Reinforce the concept that it's okay to disagree with a famous person as long as there is scientific basis for the disagreement.

References

Science Is...A Sourcebook of Fascinating Facts, Projects and Activities by Susan V. Bosak.

