



EDUCATOR'S GUIDE

Jesse Steam: Solving Mysteries through Science, Technology, Engineering, Art & Math

Title: *The Question of the Vomit Vortex*

Series Overview

Ten-year-old Jesse Steam's curiosity about how the world works leads her to one mystery after another as she pedals around town, often with Mr. Stubbs, her tabby cat, keeping her company in the bike basket. Using simple scientific tools and their powers of observation, Jesse and her friends analyze, test hypotheses, and conduct experiments. If the kids get stuck, they know they can count on Professor Peach, a retired college science educator, to step in with a clear explanation.

Each title in the Jesse Steam series focuses on one **STEAM** subject: Science, Technology, Engineering, Art or Math.

About This Book

In *The Question of the Vomit Vortex*, Jesse learns about centripetal and centrifugal forces through four crazy (and sometimes gross) events—leaves twirling through her bedroom window, chocolate milk splashing out of a pitcher after she mixes it, mud spinning off of her bicycle tires, and her friend's vomit spraying from a moving merry-go-round. She also learns the difference between tornadoes and dust devils.

This title focuses on **science**.

Next Generation Science Standards Alignments and Activities

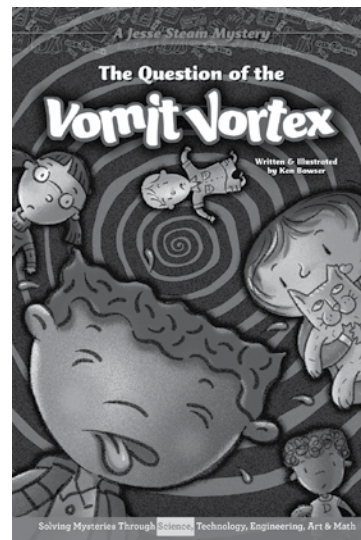
The activities and learning ideas in this guide have been correlated with the **Next Generation Science Standards (NGSS)**:

<https://bit.ly/2kx58A2>

These standards were developed by the National Research Council (NRC) of the National Academy of Sciences. The NRC's Framework for K-12 Science Education combines practices, crosscutting concepts, and disciplinary core ideas to address relevant science, technology, engineering and math (STEM) concepts that students should learn.

This title most closely relates to the standard covering motion and stability: forces and interactions:

<https://www.nextgenscience.org/pe/3-ps2-1-motion-and-stability-forces-and-interactions>.



Lexile: 850 GRL: R 3,309 words



Background and Key Concepts

The Question of the Vomit Vortex is about force, a push or pull that can cause the motion of something to change speed or direction. It touches on the following types of circular motion:

Vortex: a mass of whirling fluid or air that forms a cavity in the center toward which things are drawn.

Tornado: a violent and destructive whirling wind accompanied by a funnel-shaped cloud that moves in a narrow path over the land.

Dust devil: a small whirlwind—much smaller than a tornado—containing sand, dust, or (as in Jesse’s case) leaves.

Two types of forces can cause these types of circular motion.

Centripetal force: the force that causes something, or parts of it, to get pulled inward toward a center of rotation.

Centrifugal force: the force that causes something, or parts of it, to get pulled outward from a center of rotation.

Class Discussion

Start the discussion by asking students if they’ve ever seen or experienced a tornado. (For those who haven’t, you might want to show the “Amazing Tornado Footage” linked under the Videos section below.) Explain that the force pulling the air toward the center of the tornado is called **centripetal force**.

Then ask students if they’ve ever ridden or seen a roller coaster that loops. Ask them why they think people stay in their seats when they’re upside down (other than their seat belts). Explain that part of it is due to **centrifugal force**, a force that pulls an object away from the center of something that’s turning or rotating. Centrifugal force pulls people’s bodies away from the center of the loop and toward their seats.



Student Activity

Swing the Bucket

Divide students into pairs and give each pair the following items:

- Two 2-foot-long pieces of string
- An 8-oz. paper cup
- A pencil
- A penny

Have each pair make a mini bucket using the following steps:

1. Poke a hole near the rim of the cup with the pencil.
2. Poke a second hole on the other side of the cup, directly across from the first hole.
3. Attach each string to a side of the cup by looping the end of the string through the hole and tying a knot.

Have each pair put their penny in the cup. Standing far away from their friends and other objects, they should take turns holding the ends of the strings in one hand and whipping the bucket in a circle over their heads (like a roller coaster on a loop). Tell students they may need to sway the bucket back and forth a bit before it can make a full circle.

After everyone has had a turn, ask students the following questions:

1. When you swung the cup over your head, did the penny fall out?
2. How is this similar to a roller coaster when it goes upside down?
3. What type of force kept the penny from falling out of the cup?

Additional Resources

<https://www.livescience.com/52488-centrifugal-centripetal-forces.html>

<https://www.stevespanglerscience.com/lab/experiments/centripetal-force-board/>

Videos

Amazing Tornado Footage:

<https://www.sciencekids.co.nz/videos/weather/tornadoes.html>

Defy Gravity! Centripetal Force:

<https://www.pbslearningmedia.org/resource/phy03.sci.phys.mfw.zcentrip/defy-gravity-centripetal-force/>

The Centrifugal Force:

http://www.hellokids.com/c_31714/videos-for-kids/kids-science-experiments/the-centrifugal-force