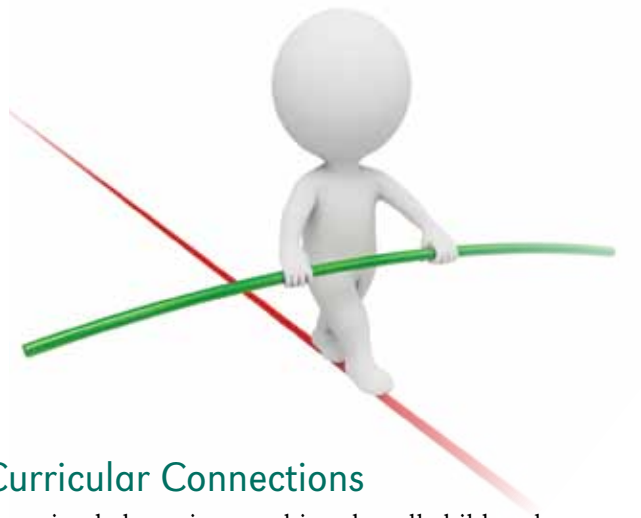

A Balancing Act

By Christine Anne Royce

Many children have seen circus performers walk the tightrope and gaze with awe at their skill and ability to keep their balance and not fall from great heights. The allure of walking a tightrope and the science of balance behind it is the feature for this month's column. Through one fictional, and one nonfictional tale, students will have the opportunity to explore activities that involve balance.

This Month's Trade Books

Mirette on the High Wire
By Emily Arnold McCully.
Scholastic. 1992.
ISBN 0-590-47693-9.
Grades K–3

Synopsis

A young girl named Mirette learns to walk along a high wire under the tutorage of the "Great Bellini." What she doesn't know is that he has lost his courage to perform and through their trials together, both learn to conquer their fear.

The Man Who Walked Between the Towers
By Mordicai Gerstein.
Scholastic. 2003.
ISBN 0-439-70041-8.
Grades 4–6

Synopsis

The planning and execution of Philippe Petit's goal to walk a tightrope between the two towers in New York City is described through text and wonderful illustrations. Throughout the story the reader is told how Philippe and his assistants managed to get the gear to the roof, string the tightrope between the two towers, and perform before being arrested.

Curricular Connections

Learning balance is something that all children learn to do from the day they take their first steps. They continue to expand their physical abilities by climbing, running, and engaging in other childhood games, however, they don't necessarily think about balance when they are engaged in these activities.

The grades K–3 activity asks young students to put themselves in the role of young Mirette on the high wire as they try to walk a tightrope and change different variables to see how those variables affect their ability to stay above a certain point. Students are asking some basic scientific questions and using "their observations to construct reasonable explanations for the questions posed" (NRC 1996, p.121). Furthermore, they also begin to see that "the position and motion of objects can be changed by pushing or pulling" (p. 127) (in this case with gravity) and begin to develop an intuitive sense of where their body should be placed.

Although *center of gravity* isn't developmentally appropriate for this age level, "teachers can build on the intuitive notions of students without requiring them to memorize technical definitions" (p. 126).

In the grades 4–6 activity, students will consider what factors go into balancing an object by manipulating variables such as position of the wire and amount of mass added. This opportunity to design a balanced object allows them to "develop general abilities, such as systematic observation, making accurate measurements, and identifying and controlling variables" (p. 145). Activities such as these are engaging and fun for students to investigate the concepts of balance and center of gravity.

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For Grades K–3: Learning to Balance

Purpose:

Students will engage in different physical activities in which they investigate ways to balance themselves.

Materials

- Masking tape, 3–4 two-by-four blocks of wood (about 4–6 ft.)

Procedure:

After reading *Mirette on the High Wire* to the class, ask the students what Mirette learned about balancing. Referring back to the pictures in the text and the cover will help students realize that she used her outstretched arms to assist with her balance.

Invite the students to become like Mirette and the Great Bellini and walk a "tightrope" in the classroom. Begin by placing a piece of masking tape across the floor. This pretend tightrope will allow students to safely practice putting their feet heel to toe on the "rope" with no risk of falling. Students should be reminded that if they step off the tape and onto the floor, they have "fallen" off the tightrope. Make sure the area is clear of hazards students could stumble into, such as table corners.

Ask students whether they have any suggestions that might make walking the tightrope easier, and allow them to try their ideas. Other students can make observations about what happens during the different attempts. Students will quickly see that the ability to keep their balance by walking heel to toe is more challenging than it looks.

Students should be invited to predict whether they feel it will be hard or easy to stay directly on the masking tape as well as other changes related to their task. What do they think would happen if they walked the "tightrope" with a book on their head? Students can try to walk with their arms held out to their sides; with a book held with both hands overhead; with a book held in one hand with the other arm stretched out; or with a book held close to their body. All of these different positions will require students to adjust how they walk on their tightrope because their center of gravity will change based on the position of the book and their arms. Although addressing the concept of *center of gravity* at this age may not be developmentally appropriate, students can make predictions about what they think will happen before each attempt and then investigate the outcome. Asking students to describe "why they feel position *x* made it easier or harder" will allow them to begin to develop the idea that balance can be affected by position of an object with different weight.

After students practice on the masking tape, make the task a bit more daring by lining the masking tape with two-by-fours, thus giving a little bit of height to the tightrope. Make sure wood blocks are smooth without rough edges or other means for students to get slivers or scrapes. This activity should be done in the gym with floor mats lining both sides of the wood block path to prevent an injury should a student lose their balance and fall. Ask the students to initially repeat walking heel to toe and see whether they are able to keep their balance as Mirette did on a much higher wire.

Once students have had an opportunity to learn how to keep their balance, ask them about other phenomena or events that require balance. Some possible answers include sitting on top of monkey bars, a bird sitting on a wire, or a squirrel running across the telephone line.

Connecting to the Standards

This article relates to the following *National Science Education Standards* (NRC 1996):

Content Standards

Standard A: Science as Inquiry

- Abilities necessary to do scientific inquiry (K–8)

Standard B: Physical Science

- Position and motion of objects (K–4)
- Motions and forces (5–8)

National Research Council (NRC). 1996. *National science education standards.* Washington, DC: National Academies Press.

For Grades 4–6: Building a Balanced Object

Purpose:

Students will attempt to make different objects balance while investigating the center of gravity.

Materials

- Pencils or craft sticks
- One piece of 20 in. pliable wire (20–24 gauge)
- Hexagonal nuts, washers, weight sets
- Safety glasses or goggles

Procedure:

After reading the book, ask the students to look closely at the different positions that Philippe was in as he was walking the high wire between the towers. The positions in the photos show that he is keeping the tightrope directly below the center of his body whether standing up or lying down. Students may also notice that the pole he uses is also spread evenly across the wire.

Ask students why it matters that half of Philippe's body is on one side of the wire and half is on the other. Potential answers may relate to his weight being equally divided or perhaps that it helps him balance. Although it does help him balance, center of gravity must also be considered.

Explain to the students that they will be provided with a pencil or craft stick that they are being asked to balance on the tip of their index finger. Once students have the materials, ask them to balance the object and then describe what they found. Many of the students will state that it tips over too easily; or they can't balance it standing straight up. Some students will turn it sideways and get it to balance that way, which is fine and allows for a rich discussion. Refer them to the book and ask them what purpose they think the balancing pole plays in helping Philippe keep his balance. Allow them to pose possible answers.

Now that the students have tried to balance their pencil by itself, provide each student with a 20 in. piece of soft, pliable wire (20–24 gauge wire works best and can be obtained from home improvement stores). Students and teachers are to wear eye protection (safety glasses or goggles) when doing this activity. Remind students to be careful when working with sharp objects like wires, as they can puncture or scrape skin.

Have the students wrap the wire once or twice around the pencil so that it will stay in place. The best way to do this is by having the wire divided equally in half. However, based on the length of wire on each side and the different amount of weight on each side, students will be able to accomplish this task in different ways.

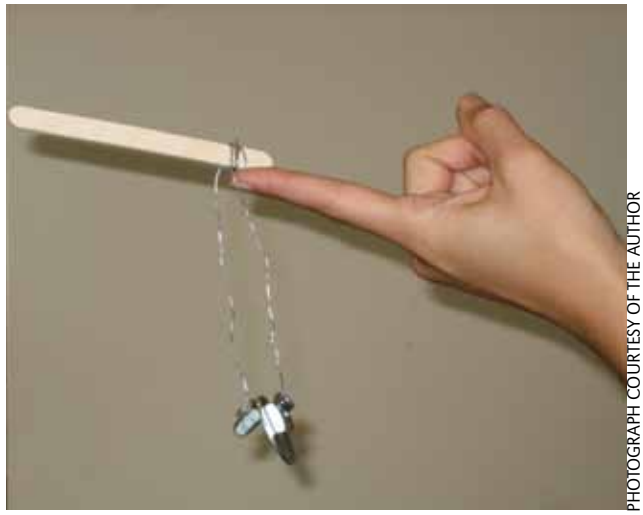
In addition to the wire, provide students with paper clips, different-size hexagonal nuts for bolts, rubber washers, metal washers, and if available, actual weights for use in a science lab. Students can add them to each side of the wire to see what helps in balancing the pencil. Students should add different weights to each side of the wire and bend the wire to find a design that allows them to easily balance the vertically upright pencil on the tip of their finger.

Propose the following questions to the students and ask them to investigate: Does it matter where the wire is placed on the pencil—at the top, in the middle, or at the bottom? What happens when you add weight to one or both sides of the wire? What do you observe happening as you bend the wire downward or upward? How can you change the distribution of the weight to better balance the pencil? Where is the point of support for their object?

Have students consider what a point of support is. A *point of support* is the actual object that is supporting something or someone trying to balance on another object which serves as the point of support. For these designs the point of support is a student's finger, whereas in the book, the point of support is the rope itself.

Ask students to make observations about when their designs are balanced, which should be when the object is directly above or below the point of support. This is called the *center of gravity.*

Regardless of whether the students ever learn to be Mirette or Philippe and walk on a tightrope, activities such as these will help them understand the concepts of balance and center of gravity in everyday life.



PHOTOGRAPH COURTESY OF THE AUTHOR