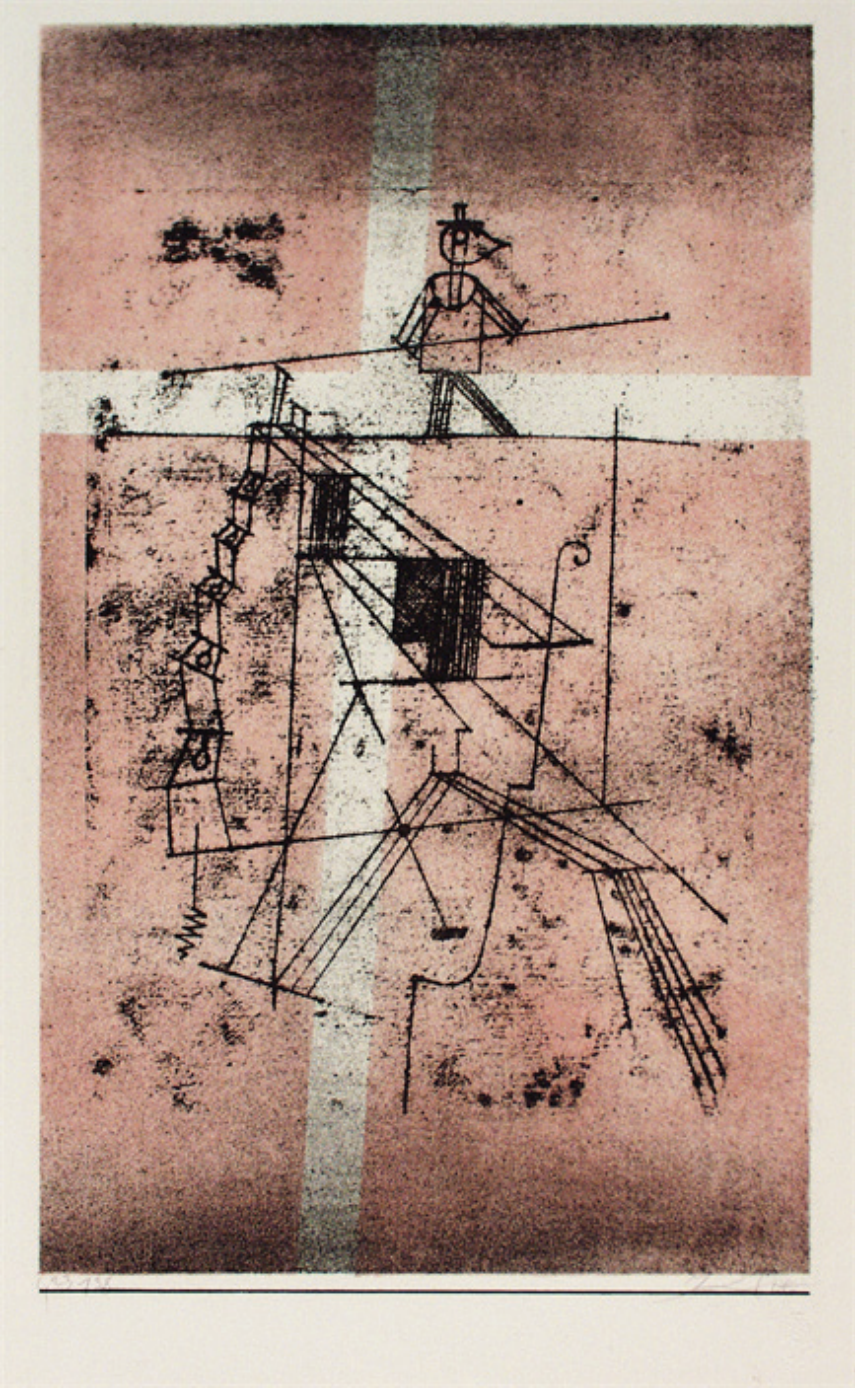
STEAM CONNECTION

DESIGN & BALANCE

GRADES K–3



Paul Klee

(Swiss, 1879–1940)

Seiltanzer [*Tightrope Walker*], 1923

Lithograph, 20 5/8 x 15 1/8 in.

Edwin B. Green Art Acquisition Endowment, 2002.32

LEARNING OBJECTIVES

- Create a unique figure using collage techniques and found materials
- Find the **balancing point** and **center of mass** of the figure by adding and subtracting found materials

1. ABOUT THIS RESOURCE

This STEAM activity guide is based on Paul Klee's 1923 lithograph titled *Seiltanzer* [*Tightrope Walker*], designed with teachers of young learners (K–3) in mind. The activities are sequenced to encourage creative expression and critical thinking. First, students will create their own unique action figures through the art of collage. Second, they will experiment with design ideas to solve the problem of balancing their action figures on a single point. This lesson is adaptable to a variety of learning objectives and abilities.

2. LEARNING OBJECTIVES

Create a unique figure using collage techniques and found materials

Find the balancing point and center of mass of the figure by adding and subtracting found materials

3. MATERIALS NEEDED

- Color image of the print *Seiltanzer* [*Tightrope Walker*] by Paul Klee, 1923
- Printed copies of Paul Klee's figure that can be used as a template (optional)
- Sturdy art and design materials for constructing the figure, such as cardboard, plastic, or wood
- Expressive materials for artistic collage:
  - Art materials such as paper, clips, scissors, tape, glue, cardboard, pencils, etc.
  - Natural materials like wood, sticks, bamboo skewers, feathers, clay, rocks, leaves, etc.
  - Recycled materials including cardboard boxes, plastic lids, twist-ties

4. VOCABULARY

Balance Point

A single spot at which an object's weight is equally distributed.

Center of Gravity (Center of Mass)

An imaginary point in an object where the total weight of the body is thought to be concentrated. For example, in spherical object where weight is evenly distributed, like an orange, the center of mass would be in the middle of the orange. In contrast, for objects where the weight is not distributed evenly, like a pair of scissors or the human body, the center of mass would be located closer to the heaviest part of the object. Adding weight (balancing props) to the action figure will change the center of gravity. Physics note: In uniform gravity, the center of gravity is the same as the center of mass.

Counterbalance

A weight that balances another weight

Force

An influence that produces motion or stress in a stationary body

Gravity

An invisible force that pulls a body of matter down towards the earth.

Stability

The ability of a body or object to restore itself to a state of balanced equilibrium after it has been slightly displaced by an outside force.

5. ACTIVITY ONE CREATING ACTION FIGURES THROUGH ARTISTIC COLLAGE

STEP ONE: CLOSE LOOKING

Look closely at the Paul Klee lithograph, and encourage students to share their observations, with a focus on how Klee represents balance.

DISCUSSION QUESTIONS

What is gravity?

What elements create a feeling of stability in this image? How about instability?

What physical forces are important for the tightrope walker?

Can you identify the balance point?

Can you identify the center of gravity for the action figure?

As the figure moves, what can they use for a counterbalance?

STEP TWO: CREATE ACTION FIGURES

Students will create their own action figures using collage techniques with art supplies and found materials. Strong and sturdy materials are recommended so that the figures will hold their shape during Activity Two (Balancing Design Experiment Phase). Remember that students will be adding heavy materials to their action figures to experiment with balance, so stronger materials will work best.

Here are two different options for creating action figures:

Option one — Create unique action figure

Students create action figures based entirely on their imaginations. The action figures can be drawn and cut out from sturdy materials like cardboard or soft plastic.

Option two — Acrobat Template

Students use the acrobat template at the end of this resource to transform through the process of collage art.

For younger learners, teachers may want to pre-cut the figures.

The time that students spend creating their collage action figures will vary according to each person.

In a classroom, this would be a good activity for one full class period (50 minutes).

6. ACTIVITY TWO DESIGN THINKING AND BALANCING ACTION FIGURES

STEP ONE: ENACTING PHYSICS CONCEPTS AND BALANCE VOCABULARY

After discussing the print, the teacher can lead students in a physical activity to apply the balancing concepts and vocabulary to themselves before they move to the design activity.

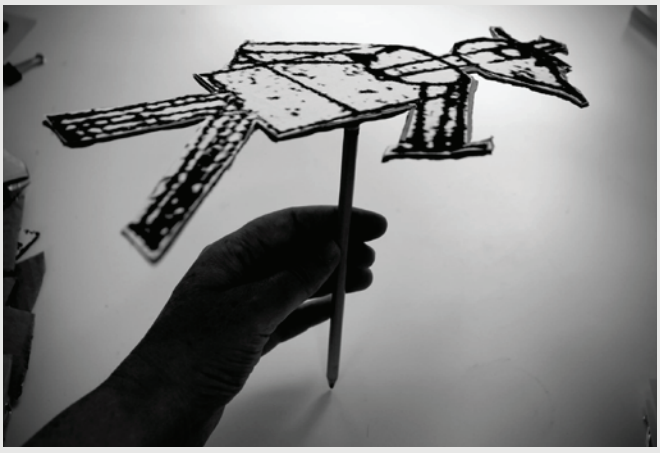
- Imagine a line on the ground that is a tightrope wire.
- Find a pose and balance on one point. See how long they can hold the pose without falling.
- Find a different pose. How did the **balancing point** change?
- Where is their own **center of gravity**?
- What can they do to create a feeling of **stability**?
- What makes them feel less **stable**?
- What can they use for a **counterbalance**?

STEP TWO: DESIGNING SOLUTIONS TO BALANCE ACTION FIGURES

Based on concepts introduced in the previous steps, students can now move with greater confidence to solve the very precarious problem of gravity and balance using their own amazing action figures. Through a process of trial and error, young designers will experiment with gravity and balance. A sequence of tasks is outlined below that teachers can use to guide exploration.

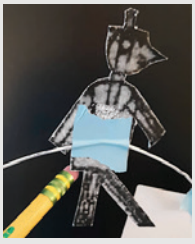
Task one: Find the center of gravity and balancing point of their figure as a solitary form.

Notes: If your figure is flat, the center of gravity and balancing point will be the same. See photo below as an example. Optional: teachers can request that students mark the balancing point on their action figures.



Task two: Use design thinking to experiment.

Guiding questions: How can you change the center of gravity? How can you change the balancing point?



Learners will become engineers and experiment with designing objects that improve or change the balance of their action figures. Try adding and subtracting different elements to see what happens.

In the photos to the left, we share a simple design solution. First, we taped one piece of wire (made from an extended paperclip) to the figure. We curved the wire downward and taped index cards to both ends of the wire. This design solution produced a balancing point on the left side of the figure's torso. The figure is balancing on a pencil eraser.

7. SUMMARY OF ACTIVITIES

For the students, it is important that they have time to play and experiment with a variety of different materials. First through art, they will use their imagination to create their own action figures. Then, these figures will become the physical models for their own problem solving and design thinking.

First as artists and then as engineers, students will experiment with materials and design props to explore the force of gravity and find new ways to balance their own action figures.

8. EXTENSION

Presentation of projects and student led discussion to share their own experiences

DISCUSSION QUESTIONS

What are the most significant artistic elements of their action figures?

What design ideas did they try to balance their figures?

What ideas worked best? What ideas didn't work? Why?

9. STATE STANDARDS

Teachers can adapt the lesson to apply to a number of state standards.
We included a few standards that the lesson meets below.

K-2 VISUAL ARTS

Anchor Standard 2
Organize and develop artistic ideas and work.

Enduring Understanding
Artists and designers experiment with forms, structures, materials, concepts, media, and art-making approaches.

Essential Question(s)
How do artists work? How do artists and designers determine whether a particular direction in their work is effective? How do artists and designers learn from trial and error?

K-2 ENGINEERING DESIGN

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem (K–2–ETS1–2).

Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each design performs (K–2–ETS1–3).