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Leap into science

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Wind

ACKNOWLEDGEMENTS

AUTHORS: Rachel Castro-Diephouse, Tara Cox, Julia Skolnik, Jillian Clark, Dale McCreedy, Peg Szczurek, Lori McCracken

DESIGNERS: Kelli Cavanaugh, Jennifer Dudek

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What is Leap into Science?

OVERVIEW

Developed by The Franklin Institute Science Museum in Philadelphia, PA, Leap into Science is a national program designed to build interest and skills in science and literacy for children ages 3–10 and their families, in community settings like libraries, museums, and out-of-school time programs. The program originated in 2007 through a partnership with the Free Library of Philadelphia, with the goal of engaging underserved children and families across Philadelphia in science and literacy learning. In partnership with the National Girls Collaborative, Leap into Science is now being disseminated through state partnerships between museums, libraries, out-of-school time organizations, and others, to reach a broader and more diverse audience of children and families nationwide. For more information, visit http://leap.fi.edu.

KEY ELEMENTS OF WORKSHOPS

- Integrate **open-ended science activities with children's books** to highlight critical thinking skills that are important in both science and literacy.
- Provide opportunities to **think like a scientist** by making observations and predictions, testing ideas, and learning from something that may not have worked as planned.

PROGRAM GOALS

- For **children and families** to have fun exploring science and books together, think scientifically, and build positive attitudes toward science learning in informal community settings.
- For **educators** to build knowledge, skills, and confidence in leading engaging science and literacy learning experiences for children and families.
- To build partnerships between **informal organizations** like libraries, museums, and out-of-school time organizations, and build their capacity for engaging underserved communities in science and literacy learning.

Leap into science

core four

Ask Questions

Encourage Scientific Thinking

Cultivate Rich Dialogue

Make Connections

Leap into Science Core Four

Strategies for Building Science and Literacy Skills

1. Ask Questions

Ask questions when reading stories and exploring science concepts to deepen children's thinking and engagement.

Why:

- Questions bring out people's natural curiosity, motivating them to explore and learn.
- Questions allow children to express their ideas through language.

How:

- Ask *open-ended* questions—questions with multiple possible responses—to help children explain their thinking. Examples: *What do you notice? Why do you think that?*
- Ask *closed-ended* questions—questions with one or a few possible responses—to guide children toward a particular area of focus. Examples: *Where do you think the balancing point is? Where did the ball go when it fell?* Often follow up with an open-ended question: *Why do you think that? How can you tell?*

2. Encourage Scientific Thinking

Encourage children and their caregivers to think scientifically by observing, asking questions, making predictions, testing their ideas, and learning from repeated attempts.

Why:

- These practices strengthen critical thinking skills that are essential in both science and literacy learning.
- Focusing on the *process* of science rather than a specific *product* or outcome frees children and their caregivers to explore and take risks.

How:

- When reading a storybook, invite children to make observations about the book's cover, predict what they think will happen next, ask questions about the illustrations, and draw conclusions about the story.
- During science explorations, point out occasions when people notice things, guess what will happen, test a new idea, or learn from something that didn't work.
- Model scientific thinking yourself. If you don't know the answer to a participant's question, respond with: *I don't know! Let's find out together!*

3. Cultivate Rich Dialogue

Provide opportunities for children and their caregivers to learn new vocabulary words, use them in different contexts, and have meaningful conversations while learning together.

Why:

- Literacy skills develop when children use language in relevant contexts, such as everyday science concepts. Similarly, science learning requires language through describing, questioning, and communicating ideas.
- Rich dialogue during learning allows people to explore new concepts together, and strengthen their ability to express their ideas.

How:

- Define and use key vocabulary during the explorations.
- Encourage children and families to connect their ideas and discoveries back to words and concepts from the book(s).
- Encourage children and their caregivers to explain their ideas to each other during their explorations.

4. Make Connections

Connect learning experiences to people's everyday lives and interests to make the learning more meaningful and memorable.

Why:

- People understand new information better, and are more motivated to learn, when the topic is connected to their own experiences.
- Highlighting how children behave like scientists during their explorations can help them see themselves as scientists, and potentially increase their future interest in science careers.

How:

- Draw connections between children's everyday experiences and the books, activities, and science concepts by asking children about their interests relating to the topic; for example: *What do you like to do outdoors? What is it like to do that on a windy day?*
- Encourage children and their caregivers to reflect on the ways they were scientists during the workshop. Ask questions like *How did you feel like a scientist today?* or use a book, such as *What is a Scientist?* by Barbara Lehn, to guide the discussion.
- Introduce children and their caregivers to science role models who reflect their race, ethnicity, gender, and/or cultural background, either in person or through books, photos, articles, or credible websites.

Choosing Books for Leap into Science

Leap into Science workshops incorporate children's picture books in two key ways: **read-aloud stories** and **exploratory books**. The guidelines below outline important criteria for choosing books for each category. Specific books that follow these guidelines are recommended for each Leap into Science workshop. You are also encouraged to select alternate books that meet these criteria in order to best match the experiences and needs of your audience.

READ-ALOUD STORIES

PURPOSE: The read-aloud story plays a crucial role in every Leap into Science workshop. It introduces key science ideas and vocabulary to children and families through a comfortable and engaging group experience. This story lays a foundation for the concepts that will be explored later in the workshop, while providing interactive opportunities for children and families to connect these ideas to their personal experiences.

Look for:

Captivating story

Clear and accurate science concept

Relevant ethnicity, culture, and language

Avoid:

Too long

Too much text

Too many unfamiliar words

Tips:

Keep the illustrations visible while reading

Pause during the story to encourage reflection

Characteristics to look for:

- **Captivating story.** Choose a book with a story that will hold your audience's attention. Children (and adults) are more likely to stay engaged and remember ideas when they are interested in what will happen next. Preschoolers generally prefer simple stories with compelling illustrations and only a sentence or two on each page; elementary-aged children can focus their attention on more complicated stories and longer texts.
- **Clear and accurate science concept.** Select a book that clearly and accurately illustrates the science concept(s) of the workshop through the story and the illustrations. For example, if the key idea is that wind moves other objects, the book should include multiple images and events in the story showing objects being moved by the wind. It is also critical that the way the science concepts are presented in the book does not lead to misconceptions. For example, stories that personify the wind

as a character instead of an inanimate force might lead to misunderstandings as children explore wind, such as thinking a pinwheel spins faster because the wind is angry. If a book does contain potentially misleading imaginary elements, be prepared to briefly discuss how and where the story is not scientifically accurate.

- **Relevant ethnicity, culture, and language.** Whenever possible, choose books that reflect the ethnicity, culture, and language of your audience. This allows children and families to make more meaningful connections to the content and to enrich their own identities as science learners.

Characteristics to avoid:

- **Too long**. Even with an engaging story, children may have difficulty maintaining attention if the book has too many pages or takes too long to read. Generally, reading the book should take no more than five to ten minutes, with a few additional minutes for reflective questioning and discussion.

- **Too much text**. Pay attention to how much text is on each page of the book. Seeing a new page of illustrations every few sentences keeps children engaged and helps them visually connect with the words they are hearing. Books with long paragraphs of text between page turns or with only small illustrations may challenge children's ability to focus on the story and the science concepts you are introducing. If a book has strong illustrations but too much text, consider reading only one or two key sentences from each page, or instead use it as an exploratory book later in the workshop (see suggestions below).

- **Too many unfamiliar words**. While children don't need to know every word in a story, too many unfamiliar words will get in the way of their understanding. Think carefully about how many words in the book might be unfamiliar to your audience. You can pause to explain or define a key word or two during the read-aloud if necessary, but if there are more than three important words that will need explanation in addition to your science concept, consider using it as an exploratory book instead (see suggestions below).

Tips for using read-aloud books during workshops:

- **Keep the illustrations visible while reading**. Hold the book open to the side of you as you read the text, keeping the illustrations visible to the audience at all times. This maximizes comprehension for children by helping them to visualize the story as they hear it.

- **Pause during the story to encourage reflection**. Select places in the story to pause and ask a reflective question that allows children to notice something in the illustrations, make a prediction about what will happen next, or reflect upon what happened in the story. This builds skills in active listening and rich comprehension while reading.

EXPLORATORY BOOKS

PURPOSE: Exploratory books extend the concepts of the read-aloud story and science explorations in Leap into Science workshops by providing additional information or context for the science ideas. They can be used to complement tabletop activities or in a reading station for children and families to explore on their own. Exploratory books can also be referenced during a reflection at the end of a workshop, using one or two pages from the book to present a new perspective or to introduce a science role model.

Look for:

Accurate science content and engaging illustrations

Relevant ethnicity, culture, and language

Books that highlight the process of science

Avoid:

Outdated science content

Text-only books

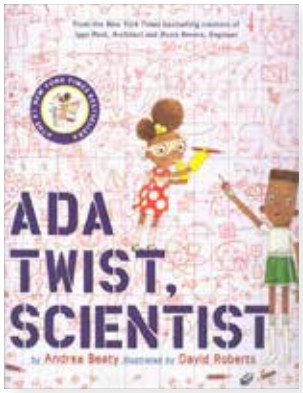
Tips:

Use illustrations to support exploration

Highlight diversity to build science identity

Characteristics to look for:

- **Accurate science content and engaging illustrations**. Choose fiction, nonfiction, or informational books with accurate science content to allow children and families to learn more about the science concepts introduced in the workshop. Photos or illustrations that clearly demonstrate the concepts provide a way to engage with the information even for those who are not able to read the text.
- **Relevant ethnicity, culture, and language**. Whenever possible, choose books that reflect the ethnicity, culture, and language of your audience. This allows children and families to make more meaningful connections to the content and to enrich their own identities as science learners.
- **Books that highlight the process of science**. Include books that show children engaged in the process of science, such as *What Is a Scientist?* by Barbara Lehn or *Ada Twist, Scientist* by Andrea Beatty. These books connect families' explorations during the workshop with science skills and help children identify themselves as scientists.



Characteristics to avoid:

- **Outdated science content.** Scientific research continually leads to new discoveries and changes in our understanding of the world around us. Check for up-to-date content and avoid books where current research or terminology may have advanced past what is represented in the book.
- **Text-only books.** While exploratory books may contain more text than a read-aloud book, avoid chapter books or those with long blocks of text and few illustrations. Books that allow children and families to engage by looking at a few pages or reading a short story are more conducive to collaborative exploration of science ideas.

Tips for using exploratory books during workshops:

- **Use illustrations to support exploration**. Emphasize a relevant illustration that relates to a tabletop activity by bookmarking the page or placing the book open to that page at the activity station. During explorations, point out individual photos as examples for inspiration or to support problem-solving. For example, show pictures of windmills or windsocks to help participants think about designs for their own wind-detecting devices.
- **Highlight diversity to build science identity.** Create opportunities to highlight images and stories that illustrate diverse characters and cultures, which help children and families connect their own experiences with scientists and science practices. Read a relevant page from a book to a small group, or point it out to a caregiver to share with their child. During a workshop's closing reflection, incorporate a book that shows children engaging in science or that introduces a science role model whose background is similar to that of your audience.

About Wind and Air

Air is everywhere—but how do we know it exists if we can't see it? Air is most noticeable when we feel it in the form of wind. Wind can be a light breeze that blows our hair on a spring day, or a strong gust that knocks down trees during a powerful storm. We can also see air when it fills up space inside a bubble or a balloon. The Leap into Science wind workshops invite children and families to experiment with air and explore the ways that an invisible substance can produce visible effects.

SCIENCE IDEAS

- **Air exists and takes up space.** Air is a mixture of gases—mostly nitrogen and oxygen, along with some carbon dioxide and other gases. These gases are invisible to our eyes, but we know that air exists because we can see that it takes up space. When we add air to a balloon, an air mattress, or a sealed plastic bag, those things take up more space than they did without the air inside. When we put an air-filled bottle underwater, we see bubbles as the escaping air pushes the water out of the way.
- **Wind is moving air.** When air molecules are pushed and begin to move together in the same direction, this creates wind. We can push air to make wind by blowing it with our mouths, squeezing it out of a squeeze bottle, or moving it with a fan. In the atmosphere, wind is created when air is heated by the sun. The warm air rises, and cooler air rushes in to take its place below. The temperature difference between the two air masses determines how fast the wind blows.
- **Tools help us detect and measure wind.** Since we can't see air moving, we rely on tools that show the wind's effects to help us measure its speed and direction. Something as simple as a streamer or flag can indicate the strength of the wind by how much it moves. Weather vanes turn to identify the direction of the wind, windsocks inflate to different angles at different wind speeds, and pinwheels and windmills spin faster or slower depending on how fast the wind blows. Meteorologists use pinwheel-like instruments called ***anemometers*** (rhymes with "thermometers") to measure wind speed. An anemometer records how many times it spins in a set period of time, and uses this to calculate how fast the wind is blowing.

Wind and Young Learners

For preschoolers, the goal of these explorations is **not** to fully understand or define air and wind. Air is difficult for young children to understand because they cannot see it or hold it. However, they don't need to fully understand air in order to explore and manipulate wind. They are fascinated by how wind moves things, from the bobbing of a balloon in the air to a gust of wind that snatches a baseball cap from someone's head.

Encourage preschoolers to notice how wind moves objects in different situations and to describe the differences they see. They might use words like "big" and "small" to talk about the strength of wind, or "a lot" and "a little" to express how much an object moved.

weather vane

windsock

pinwheel

anemometer

wind turbines

windmill

Wind Preschool Workshop

AUDIENCE

Children ages 3–5 and their caregivers

TIME FRAME

40–60 minutes

SUMMARY

Children explore the properties of wind and air by listening to a story about wind, moving a variety of objects using wind, and creating a wind detector that moves in the wind.

GUIDING QUESTIONS

- How do different kinds of objects move in the wind?
- How does the strength of the wind affect how objects move??

KEY WORDS

Use these key vocabulary terms throughout the workshop to build understanding about wind:

wind

air

breeze

gust

strong

gentle

PREPARE

1. Review the Wind Preschool Question Guide on p. 21 and think about when and how you will incorporate questions into your facilitation of the workshop. You may also wish to make copies of the Question Guide for caregivers to use during the workshop and/or to take home.

2. If possible, research scientists whose work involves wind (such as meteorologists or aircraft engineers) and who match the demographics of your audience or are local to your area. Gather photos, books, or articles about them to share with the group.

3. Cut yarn, ribbons, crepe paper, and/or tissue paper into strips of varying lengths (about 3"–8" long, and 2" wide) for children to use in making wind detectors. Plan for 3–6 pieces total per child. You may also wish to pre-cut pieces of masking tape for children to use more easily during the workshop.

4. Assemble a sample wind detector by taping a few lengths of ribbon, paper, yarn, and/or feathers to the end of a craft stick (see photo).

    - *Note*: Very young children may have difficulty operating the squeeze bottles. If your group is primarily 2- or 3-year-olds, you may want to omit the bottles and provide cardboard sheets or fold simple accordion fans from paper to use instead.

5. Set up the space:

    - Place the materials for making wind detectors on a table or other work surface. Plug in the electric fan in a safe location nearby.

    - Arrange an open area of floor for children to blow objects with squeeze bottles or fans, allowing plenty of space for children to move freely. Set up one station with the squeeze bottles and a separate station with the paper fans, cardboard sheets, and/or personal fans.

    - *Optional:* Create a book corner with recommended books and/or materials for drawing.

MATERIALS

- A read-aloud book, such as: *The Wind Blew* by Pat Hutchins or *Kite Flying* by Grace Lin
- *What Is a Scientist?* by Barbara Lehn
- Plastic squeeze bottles (1 per 2 children)
- Paper hand fans or small cardboard sheets (4" x 6" or larger)
- Small pompoms (1 per child)
- A variety of heavier and lighter objects to blow, such as pompoms, craft feathers, coffee filters, tissue paper, leaves, Styrofoam balls, tennis balls, small plastic toys, stuffed animals, etc.
- Electric fan
- Wooden craft sticks (at least 1 per child)
- Crepe paper or tissue paper
- Ribbons
- Yarn
- Craft feathers
- Roll of masking tape
- Copy of **breeze** and **gust** word cards, printed on card stock

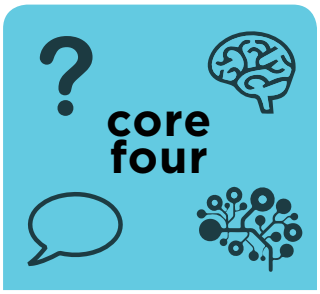
Optional Additional Materials

- Large foam board or tray
- Personal fans, battery-operated or hand-crank
- Two bins, shoebox size or larger, labeled "Easy to Move" and "Hard to Move" for sorting objects
- Additional exploratory books about wind (see Recommended Book List on p. 40)
- Paper
- Crayons or markers
- Photo, book, or article about a scientist whose job involves wind

BOOK CHOICES: Use one of the recommended read-aloud books above, or choose an alternate book that follows the guidelines on pp.8–10.

WELCOME (5 minutes)

- Welcome children and caregivers to the workshop. Introduce yourself to the participants.
- Explain that today's workshop was developed by The Franklin Institute, a science museum in Philadelphia. The goals of the program are to have fun exploring wind together and to feel like scientists.
- Set expectations for children's and caregivers' respective roles; for example: *Kids, you are the scientists today. Grown-ups, your job is to help your scientists—ask them questions, and let your children take the lead!*



Words in bold highlight Core Four strategies
(see pp. 5–7 for details)

ENGAGE: Breeze and Gust (10 minutes)

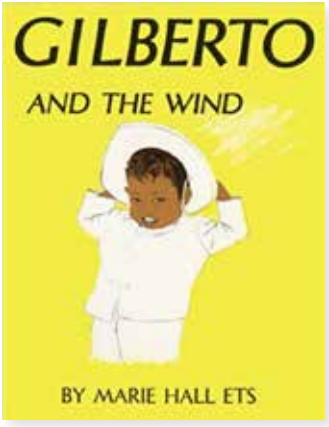
- **Make connections** to participants' everyday lives by asking about their experiences with wind. For example:
  - *Have you ever been outside on a windy day? What did it feel like?*
  - *What do you see outside when the wind is blowing?*
- Invite children to make their own wind by blowing on their hands. **Cultivate rich dialogue** by asking the group to talk about the wind they made, and what they observed:
  - *What did you notice? How did it feel?*
  - *Who made a soft, gentle wind? What did that feel like?*
  - *Did anyone make a strong, hard wind? What did you notice?*
- Invite the group to blow a gentle **breeze** on their hands. Demonstrate by blowing gently on your own hand and explain that a breeze is a gentle, soft wind. Introduce the **breeze** word card and say the word together.
- Ask children to blow a strong gust on their hands. Demonstrate on your own hand and explain that a gust is strong blast of wind. Show the **gust** word card and say the word together.
- Give each child a pompom to place on top of their open hand. Invite them to first blow a **breeze** on the pompom and notice what happens. **Encourage scientific thinking** by asking them to predict what will happen if they blow a **gust** on the pompom:
  - *Will it be the same as the breeze or different?*
  - *What do you think will happen?*
- Invite them to try blowing a gust and make observations about what happens. **Cultivate rich dialogue** by inviting the group to describe how the pompom moved differently in the gust and the breeze.

- *Optional*: Invite the group to stand up. **Encourage scientific thinking** by asking them to predict how it will feel if you create a gentle breeze on them. Gently move the tray or foam board up and down to create a breeze on the group.
  - › *What did you feel? Did you see anything?*
  - › *Look at the clothes and hair of the people next to you as I do it again.*

  Ask the group to predict what will happen if you make a gust instead of a breeze. Move the tray quickly up and down to produce a gust. **Cultivate rich dialogue** by inviting them to share their observations.
  - › *What did you notice about people's hair and clothes this time?*
  - › *How was it different with the gust instead of the breeze?*

READ: Storytime (10 minutes)

- Show children the read-aloud book and introduce the title and author. **Encourage scientific thinking** by inviting children to make observations about the cover of the book and predictions about the story:
  - › *What do you notice on the cover of this book?*
  - › *What do you think this story might be about? What makes you think that?*
  - › *Where do you think there might be wind in this story?*
- Read the story, pausing to ask reflective questions that relate to wind and air. **Encourage scientific thinking** by inviting children to observe places in the story or illustrations where objects are moving in the wind and make predictions about what will happen next. **Ask questions** like:
  - › *Where do you see something moving in the wind on this page?*
  - › *Do you think this wind is a breeze or a gust? What makes you think that?*
  - › *What do you think will happen next?*
- **Make connections** between the moving objects in the book and the previous exploration:
  - › *When you made a gust on your pompom, did it move a little or a lot?*
  - › *How is that like what you see in the story?*



EXPLORE: Making Wind (10–15 minutes)

- Divide the group between the squeeze bottle station and the fan station and invite children to explore making wind. Demonstrate how to use each of the tools to make wind. Point out that after squeezing the bottle to push air out, they should release it so it can refill with air. Encourage children to practice making wind with the tools as needed.
- Introduce the feathers, pompoms, and other objects on the floor and invite children to blow them around the room by making wind with their bottle or fan. As they explore, **encourage scientific thinking** by inviting them to describe what they see, predict what will happen, and explain their thinking:
  - *What do you notice about how that object moved?*
  - *Which one do you think will move further? What makes you think that?*
- Extend children's exploration by proposing new challenges and allowing children opportunities to switch stations and experiment with different wind-making tools. **Ask questions** like:
  - *How could you move this object even further?*
  - *What would happen if you blew the object with a fan instead of a squeeze bottle?*
  - *What else could you try?*
- **Cultivate rich dialogue** by encouraging conversation between adults and children about their explorations. Suggest questions (like the ones on the Question Guide on p. 21) for adults to ask their children about moving objects in the wind. Provide opportunities to reinforce the vocabulary words **breeze** and **gust** during the exploration, such as:
  - *Are you making a breeze or a gust? How can you tell?*
- *Optional*: If time allows, invite children to reflect on their experimentation by sorting the objects into two bins based on whether the objects were "easy to move" or "hard to move" in the wind. Have children help you test each item with a fan or squeeze bottle again, if necessary. **Cultivate rich dialogue** by asking children to talk about their decisions:
  - *Was this one easy to move with the wind, or hard to move? How can you tell?*
  - *What happened when you blew a breeze on this one?*
  - *Did it move when you blew a gust on it?*

EXPLORE: Wind Detectors (10–15 minutes)

- Gather the group at the tabletop work area and show them the sample wind detector. Explain that a wind detector can detect, or show, when the wind is blowing. (If appropriate for your group, you could point out that "detector" sounds like "detective." A detective looks for clues to solve a mystery, and a wind detector shows clues about how the wind is blowing!) Blow on the detector to show how it moves in the wind. **Cultivate rich dialogue** by using the vocabulary words **breeze** and **gust** to describe your actions:
  - *What do you notice about the wind detector when I make a breeze on it?*
  - *How does it move when I make a gust?*
- Introduce the craft sticks, tape, and other materials, and invite children to create their own wind detectors. Encourage children to make their own choices about the materials they will use. Remind caregivers to actively support their children by asking guiding questions but allowing children to find their own answers. Model this by asking questions to help children reflect on their design choices:
  - *What kinds of material did you choose for your wind detector?*
  - *How do you think that material will move in a breeze? What about a gust?*
- Turn on the electric fan. Invite children to test their wind detectors, both by blowing them with their mouths and by placing them in front of the fan. **Encourage scientific thinking** by inviting them to observe what happens, make predictions, and try new things:
  - *Which parts of your wind detector move differently in a breeze or a gust?*
  - *What do you think would happen if you used a longer piece of ribbon instead?*
- Challenge children to change or add to their wind detectors based on their tests:
  - *What could you add to your wind detector so it would move differently in the wind?*
  - *How could you change your wind detector to better show if the wind is a breeze or a gust?*
- *Optional*: Invite children who finish early to create a second design, read books in the reading area, or write or draw about their experiences.

REFLECT: Discussion (5–10 minutes)

- Gather the group and **ask questions** to help children reflect on their explorations:
  - *How did you move things with the wind today?*
  - *How did you make a breeze? What about a gust?*
  - *Did anything happen that surprised you? What was it?*
- **Make connections** between children's actions and scientific practices by referencing pages from the book *What Is a Scientist?* and asking children to share their own examples from today's workshop. **Ask questions** like:
  - *How did you feel like a scientist today?*
  - *When did you make a guess about something and test it?*
  - *Was there a time when you tried something over and over?*
  - *Did you have fun?*
- If possible, share a photo, book, or article about a scientist whose job involves wind.
- End by thanking the group for doing great work as scientists. **Make connections** to children's lives by encouraging them to notice how objects move in the wind outside and at home.

EXTEND: Additional Activity Ideas

- Look out a window when the wind is blowing. Invite children to notice the grass, leaves, and people walking by.
  - *What do you see that lets you know the wind is blowing?*
  - *Would you call the wind a breeze or a gust? What makes you think that?*
- Take the group outside or around the classroom to collect other small objects to blow with the squeeze bottles or fans. Invite children to make predictions about how the objects will move. Then invite them to explore and experiment.
- Take the group outside with their wind detectors, and notice how the wind moves them.
  - *How does the wind move your detector differently outside?*
- Allow students to work together to create a large-scale wind detector to place outside your library, museum, or school building (for example, with a yardstick and a variety of ribbons or other materials). Find an appropriate location where it can indicate the strength of the wind. Be mindful of wet weather conditions in selecting materials and location!
- Introduce additional vocabulary words to describe different wind strengths, such as those used in the Beaufort Scale (see the Wind Elementary Workshop, p. 30) Invite children to act out or draw the different levels of wind.

Wind Preschool Workshop Question Guide

Here are some key questions you can ask to guide children's explorations during the workshop.

WORKSHOP SECTION	ASK
ENGAGE: Breeze and gust Blow on pompoms Make wind with tray	*What does a windy day look like outside?* *What does a soft, gentle **breeze** feel like?* *Did anyone make a strong, hard **gust**?* *What did you notice?*
READ: Storytime	*What do you notice about the cover of the book?* *Where do you see something moving in the wind?* *Do you think this is a **breeze** or a **gust**?* *What makes you think that?*
EXPLORE: Moving objects with wind Wind detectors	*What do you notice?* *How could you move this object even further?* *How could you change your wind detector to better show if the wind is a **breeze** or a **gust**?* *What do you think would happen if you . . . ?*
REFLECT: Group discussion Read *What Is a Scientist?* Introduce a scientist	*How did we make things move in a **breeze** and a **gust** today?* *Did anything happen that surprised you? What was it?* *How did you feel like a scientist today?*

To find out more about The Franklin Institute and Leap into Science, visit leap.fi.edu.

Leap into science
Engineered by THE FRANKLIN INSTITUTE

Wind Elementary Workshop

AUDIENCE:

Children ages 6–10

TIME FRAME:

40–60 minutes

SUMMARY:

Children explore ideas about wind and air by listening to a story, creating a wind-detecting device, and testing their device in a variety of wind speeds.

GUIDING QUESTIONS

- How does wind affect objects differently?
- How can we detect how strong the wind is?

KEY WORDS

Use these key vocabulary terms throughout the workshop to build understanding about wind strength:

breeze

gale

light

moderate

strong

PREPARE

1. Review the Wind Elementary Workshop Question Guide on p. 30 and think about when and how you will incorporate questions into your facilitation.
2. If possible, research scientists whose work involves wind (such as meteorologists or aircraft engineers) and who match the demographics of your audience and/or are local to your area. Gather photos, books, or articles about them to share with the group.
3. Set up the space:
   - Place the scissors, tape, and other materials for making wind detectors on a table or other work surface.
   - Set up a wind station with the electric fan(s) and air cannon on a tabletop surface near outlets for children to test their devices. If you have multiple fans, set one at low speed and the other at high speed.
   - *Optional:* Create a book corner with recommended books and/or materials for drawing or writing.

MATERIALS

- A read-aloud book, such as: *Kate, Who Tamed the Wind* by Liz Garton Scanlon or *Gilberto Y El Viento (Gilberto and the Wind)* by Marie Hall Ets
- *What Is a Scientist?* by Barbara Lehn
- Pinwheel
- Decorative windsock
- Small electric fan with multiple speed settings
- Air cannon
- Roll of masking tape
- Scissors (1 per 3–4 children)
- Materials for creating wind detectors, such as:
  - Wooden craft sticks
  - Straws
  - Unsharpened pencils
  - Chenille stems
  - Ribbon
  - Yarn
  - Tissue paper
  - Crepe paper
  - Fabric scraps
  - Construction paper
  - Coffee filters
  - Paper clips
  - Push pins
  - Paper cups
  - Brown paper bags
- Copy of Beaufort Wind Scale, printed on cardstock
- Copy of **breeze** and **gale** vocabulary cards, printed on cardstock

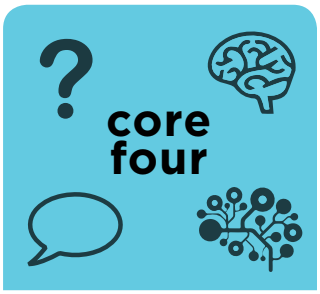
BOOK CHOICES: Use one of the recommended read-aloud books above, or choose an alternate book that follows the guidelines on pp.8–10.

Optional Additional Materials

- Second electric fan
- Additional examples of wind-detecting devices, such as flags, streamers, or weather vanes
- Video clips or images of other devices that measure or move in the wind,such as weather vanes, anemometers, or windmills
- Additional books about wind (see Recommended Book List on p. 40)
- Blank paper
- Crayons or markers
- Photo, book, or article about a scientist whose job involves wind

WELCOME (5 minutes)

- Welcome children and caregivers to the workshop. Introduce yourself to the participants.
- Explain that today's workshop was developed by The Franklin Institute, a science museum in Philadelphia. The goals of the program are to have fun exploring wind together and to feel like scientists.
- Set expectations for children's and caregivers' respective roles; for example: *Kids, you are the scientists today. Grown-ups, your job is to help your scientists—ask them questions, and let your children take the lead!*



Words in bold highlight Core Four strategies
(see pp. 5–7 for details)

ENGAGE: Wind Words (5–10 minutes)

- **Make connections** to children's everyday lives by asking about their experiences with wind. For example:
  - *What are some ways you know it is a windy day just by looking out the window?*
  - *Have you seen anything in your yard or neighborhood that moves differently on windy days?*
- Hold a pinwheel where the group can see it and blow softly on it. **Encourage scientific thinking** by asking the children to make observations and inferences:
  - *What do you notice about the pinwheel?*
  - *What could you tell about the wind if you saw a pinwheel spinning like this outside?*
- Blow hard on the pinwheel and invite the group to observe the results. **Cultivate rich dialogue** by asking children to describe the wind.
  - *What kind of wind would make the pinwheel move like this?*
  - *How else could you describe this kind of wind?*
- Use the vocabulary cards to introduce the words **breeze** and **gale**. Invite the group to repeat each word with you, and demonstrate each one on the pinwheel. Explain that a breeze is a gentle wind and a gale is a very strong wind. **Make connections** to children's experience by referring to the words they chose to describe the wind on the pinwheel. For example, you might explain a breeze as a "soft," "gentle," or "slow" wind, depending on which words they used.
- Invite children to stand up and act like trees blowing first in a breeze and then in a gale. Allow children to spread out enough to avoid hitting each other. If your space doesn't permit this, you could ask a few volunteers to come to the front and demonstrate. **Ask questions** to help them think about how the trees would move:
  - *Have you ever seen a tree move in a breeze? What does it look like?*
  - *How would the tree would move differently in a gale?*

- Introduce the Beaufort Wind Scale chart. Explain briefly that two hundred years ago, a man named William Beaufort created this scale so that people could use the same words to talk about how strongly the wind was blowing. Meteorologists who study the weather still use the Beaufort Scale terms today to describe wind strength.
- Point out some of the wind scale levels and their descriptions (choose fewer with younger or larger groups). Invite children to act out each level after you introduce it. **Make connections** to children's experience by asking them to think about times they experienced these different wind levels.
  - *What would a moderate breeze look like in your neighborhood? Which things would move and which would not?*
  - *Do you think you have ever seen a strong gale? What did you see or hear that makes you think so?*
  - *A violent storm is even stronger—what do think that would look like?*
- *Optional*: Invite the group to play a wind scale game. Call out different wind scale levels at random and ask the group to act out whichever word you call. Feel free to make it silly by switching words faster and faster as you go, or by creating a storyline about a storm passing through. For example: *There's a gentle breeze blowing on you. Wait! It's getting stronger—now there's a strong breeze. Now it's a gale—I think a hurricane's coming!* You could also invite children to take turns calling out the wind words for the rest of the group to act out.

READ: Storytime (10 minutes)

- Show children the read-aloud book and introduce the title and author. **Encourage scientific thinking** by inviting children to make observations about the cover of the book and predictions about the story:
  - *What do you notice on the cover of this book?*
  - *What do you think this story might be about? What makes you think that?*
  - *What types of wind do you think we might find in this story?*
- Read the story, pausing to ask reflective questions about wind. **Encourage scientific thinking** by inviting children to observe places in the story or illustrations where objects are moving in the wind and make predictions about what will happen next. **Ask questions** like:
  - *Do you think the wind is blowing in this picture? How can you tell?*
  - *Do you think this wind is a breeze or a gale? What makes you think that?*
  - *What do you think will happen next?*
- **Make connections** between the moving objects in the book and the previous activity:
  - *What does the tree look like in this picture?*
  - *When you were acting like a tree in a gale, how did you look the same or different?*
  - *How is the main character like a scientist in the story?*

EXPLORE: Testing Wind Effects (5–10 minutes)

- As you transition to the exploration, invite the group to reflect on their experiences observing and describing wind strength. **Ask questions** like:
  - *What kinds of objects have we seen so far that can show us how the wind is blowing? How do they move differently when the wind is stronger or gentler?*
  - *Why do you think it might be important to know how fast the wind is blowing?*
- Introduce the electric fan and air cannon at the testing station. Invite one or more children to volunteer to test the devices, including the multiple speeds of the fan. **Cultivate rich dialogue** by asking children to describe the wind they feel using words from the wind scale. (Make the Beaufort Wind Scale chart available for reference.)
  - *What level on the wind scale would you use for the different speeds of the fan? Why?*
  - *What level would you choose for the air cannon? Why?*
- Show the group the windsock. **Encourage scientific thinking** by asking them to make predictions about how it will move using each of the wind devices. Invite a volunteer to test the windsock with each of the wind conditions (air cannon, low fan, and high fan). Encourage the group to observe and discuss the results. **Ask questions** like:
  - *What do you notice about the windsock? What different parts does it have?*
  - *How do you think it would move in a light breeze? What about a gale?*
  - *How did the windsock move differently in the low and the high fan settings?*
- *Optional*: Test the windsock using other ways to make wind, such as blowing with your mouth or fanning with a paper fan. Encourage children to compare how the windsock moves in each case and describe the wind using words from the Beaufort Scale. If you have additional wind-detecting devices such as flags or streamers, invite children to test them and/or the pinwheel from the first activity and compare them to the windsock. **Ask questions** like:
  - *How does this object move differently in different types of wind?*
  - *How is this object similar to the windsock? How is it different?*
  - *What does this object show us about how the wind is blowing?*

EXPLORE: Wind Detectors (20–25 minutes)

- Gather the group at the tabletop work area. Invite children to use the materials to create their own wind detector—something that detects, or shows, how the wind is blowing. (If appropriate for your group, you could point out that "detector" sounds like "detective." A detective looks for clues to solve a mystery, and a wind detector shows clues about how the wind is blowing!) Challenge them to make something that moves differently in calm (no) wind, a breeze, or a gale.

- *Optional*: Provide photos or video clips of real-life wind devices for inspiration. **Ask questions** to help children identify important aspects of the objects' designs:
  - *Have you seen anything like this before? Where did you see it, and what did it do?*
  - *What shapes are in this object? What different parts does it have?*
  - *Which parts do you think move in the wind, and which parts stay still?*
  - *How do you think this object would move differently in different types of wind?*

- **Encourage scientific thinking** by inviting children to explore the materials, predict how various materials might move in the wind, and make a plan for their wind detector. *Optional*: Invite them to sketch their plan, showing the different parts their detector will have.

- Allow time for children to test, redesign, and retest their detectors. Encourage them to test their designs at the wind test station frequently as they work. Ask them to decide whether their detector meets the design criteria (shows the difference between calm, breeze, and gale) and challenge them to look for ways to improve their design. As children work on their designs, **ask questions** like:
  - *What do you notice about how your detector moves in the high-speed fan?*
  - *How could you change your wind detector so it moves differently in light and strong winds?*
  - *Which materials might move in a strong wind but not a gentle one? How could you find out?*
  - *What else could you try?*

- **Make connections** between children's wind detectors and their experiences with the pinwheel, windsock, and the book:
  - *How did the pinwheel show different speeds of wind? How could you make your detector do the same thing?*
  - *What objects in the book moved in the gentle wind? What materials could you add to your design that might be like those objects?*

- **Cultivate rich dialogue** by inviting children to explain their ideas to one another or ask someone else about their approach. Encourage them to use words from the Beaufort Scale as they describe which wind strengths their detector indicates:
  - *It looks like someone else solved that problem another way. Tell each other what you did to show the difference between a breeze and a gale.*

- *Optional*: Invite children who finish earlier than others to explore other books about wind and write or draw about their experiences in the reading area.

REFLECT: Discussion (5–10 minutes)

- Gather the group together. **Cultivate rich dialogue** by inviting them to share their wind detectors, either with the whole group or with a partner. Encourage them to demonstrate or describe what their detector does under different wind conditions, such as a breeze or a gale.
  - *What did you do to make your detector move differently in different types of wind?*
  - *How did you decide on your design? Why did you choose to use those materials?*
  - *Did you try anything that didn't work? What did you change or learn from it?*
- **Make connections** between children's actions and scientific practices by referencing pages from the book *What Is a Scientist?* and asking children to share their own examples. **Ask questions** like:
  - *How did you feel like a scientist today?*
  - *When did you make a guess about something and test it?*
  - *Was there a time when you tried something over and over today?*
  - *Did you have fun?*
- If possible, share a photo, book, or article about a scientist whose job involves wind.
- *Optional*: Read part or all of a book that shows someone building an object to use in the wind, such as *The Boy Who Harnessed the Wind* by William Kamkwamba and Bryan Mealer or *Francisco's Kites (Las Cometas de Francisco)* by Alicia Klepeis and Gary Undercuffler. **Make connections** by relating the book to children's experience making wind detectors.
  - *What parts did you use to make your wind detector? How were they like the parts the person used in the story? How were they different?*
  - *How does the object in the story move in the wind? How is that the same as or different from your wind detector?*
- End by thanking the group for doing great work as scientists. **Encourage scientific thinking** by inviting them to continue noticing how the wind moves things outside and at home.

EXTEND: Additional Activity Ideas

- Invite children to make more observations at home with their wind detectors at the same time and place each day for one week. Challenge them to use words from the Beaufort Scale to describe and record the wind conditions.
- Encourage the group to take their wind detectors to several different outdoor locations nearby and describe the wind condition using words from the Beaufort Scale. Invite children to share their observations with each other.
    - *What can you infer, or figure out, about the weather just based on these observations of the wind?*
- Invite children to create their own wind scales like Beaufort's by choosing words to describe the winds that blow their wind detectors.
- Read and discuss an article or book about extreme weather events involving wind, such as *The Magic School Bus: Inside the Hurricane* by Joanna Cole. Encourage the group to think about the effects of tornadoes, hurricanes, or other extreme wind events in their own community.
    - *What kinds of extreme wind can happen where we live?*
    - *What are some of the ways these events affect people and the places in which they live?*
    - *What do you think people could do to prepare for a tornado or hurricane or prevent some of the damage from happening?*
- Read and discuss a book about wind energy, such as *The Boy Who Harnessed the Wind* by William Kamkwamba and Bryan Mealer, *When the Wind Blows* by Stacy Clark, or *Energy Island* by Allan Drummond. **Encourage scientific thinking** by asking questions like:
    - *Have you seen windmills or turbines in your community? What do they look like? How are they the same as or different from the ones in the book?*
    - *If you were going to build a windmill to create energy for your neighborhood, where would you put it? Why?*
    - *What are some other important uses for wind?*

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Wind Elementary Workshop Question Guide

Here are some key questions you can ask to guide children's explorations during the workshop.

WORKSHOP SECTION	ASK
ENGAGE: Wind words	*What could you tell about the wind if you saw the pinwheel spinning like this?* *Have you ever seen a tree move in a **breeze**? What does it look like?* *Do you think you have ever seen a strong **gale**? What did you see or hear that makes you think so?*
READ: Storytime	*What do you notice about the cover of the book?* *Do you think the wind is blowing in this picture? How can you tell?* *Do you think this is a **breeze** or a **gale**? What makes you think that?*
EXPLORE: Testing wind effects Wind detectors	*How is the wind from the air cannon different from the fan?* *What do you notice about how your detector moves in the high-speed fan?* *How could you change your detector to move differently in a light **breeze** and a **strong** gale?* *What else could you try?*
REFLECT: Group discussion Read *What Is a Scientist?* Introduce a scientist	*What did you do to make your detector move differently in different wind conditions?* *How did you decide on your design?* *Did you try anything that didn't work? What did you change or learn from it?* *How is your wind detector like the object(s) in the story? How is it different?* *How did you feel like a scientist today?*

To find out more about The Franklin Institute and Leap into Science, visit leap.fi.edu.

Wind Family Workshop

AUDIENCE:

Families with children ages 3–10

TIME FRAME:

40–60 minutes

SUMMARY:

In a series of activity stations, families investigate the properties of wind and air as they explore its effects on other objects.

GUIDING QUESTIONS

- How can we tell air exists if we can't see it?
- How does wind affect other objects?

KEY WORDS

Use these key vocabulary terms throughout the workshop to build understanding about wind and air:

wind

air

breeze

gale

strong

gentle

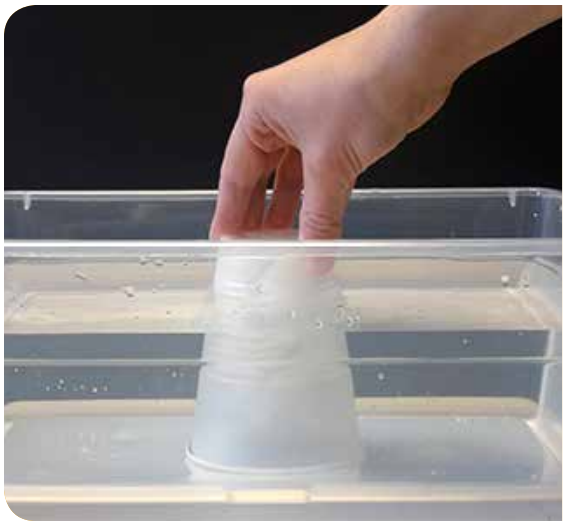
MATERIALS

- A read-aloud book, such as: *Kate, Who Tamed the Wind* by Liz Garton Scanlon or *The Wind Blew* by Pat Hutchins
- *What Is a Scientist?* by Barbara Lehn
- 15–20 clear plastic cups (8 oz.)
- Roll of paper towels
- 2–4 clear plastic shoebox-size bins
- Water
- Several clear bottles of different shapes and sizes that fit in the shoebox bins
- 2–3 ziplock bags, quart or gallon size
- 2–3 small pieces of paper (approx. 2″ square)
- 2 rolls of masking tape
- Permanent marker
- Aluminum foil roasting pan (approx. 13″ x 20″)
- 2–3 toy boats (approx. 3″–5″ long)
- Small hand-crank fan
- Wide drinking straws, cut in half (at least 1/2 straw per participant)
- Regular drinking straws, cut in half (at least 1/2 straw per participant)
- Modeling clay (approx. 1/4-inch ball per participant)
- Blank paper
- 6–8 pairs of kid-friendly scissors
- Copy of bullseye target, laminated or printed on cardstock (see Printable Resources)
- Plastic pinwheel
- Decorative windsock
- Electric fan with multiple speed settings
- Air cannon
- 2–3 plastic squeeze bottles
- 2–3 paper fans (or pieces of stiff cardboard)
- Leaves, either real or copies of leaf template cut from colored paper (see Printable Resources)
- A variety of heavier and lighter objects to blow, such as pompoms, feathers, coffee filters, tissue paper, leaves, small blocks, tennis balls, small plastic toys, stuffed animals, etc.
- Materials for creating wind detectors, such as:
  - Wooden craft sticks
  - Straws
  - Unsharpened pencils
  - Chenille stems
  - Ribbon
  - Yarn
  - Tissue paper
  - Crepe paper
  - Fabric scraps
  - Construction paper
  - Coffee filters
  - Paper clips
  - Push pins
  - Paper cups
  - Brown paper bags
- Copy of Beaufort Wind Scale, laminated or printed on cardstock (see Printable Resources)
- Copy of *Does it Move in the Wind?* chart, laminated or printed on cardstock (see Printable Resources)
- Copy of **breeze** and **gale** vocabulary cards, printed on cardstock (see Printable Resources)
- Tent cards for each station, printed on cardstock and folded (see Printable Resources)

BOOK CHOICES: Use one of the recommended read-aloud books above, or choose an alternate book that follows the guidelines on pp.8–10.

Optional Additional Materials

- Additional examples of pinwheels, windsocks, or other wind-catching devices in a variety of shapes and sizes
- Small wooden or foam blocks
- Battery-operated personal fans
- Crayons or markers
- Photo, book, or article about a scientist whose job involves working with wind
- Additional books about wind and air (see Recommended Book List on p. 40)



PREPARE

1. Review the Wind Family Workshop Question Guide on p. 39 and think about when and how you will incorporate questions into your facilitation. You may also wish to make copies of the Question Guide for caregivers to use during the workshop and/or take home.

2. If possible, research scientists whose work involves wind (such as meteorologists or aircraft engineers) and who match the demographics of your audience and/or are local to your area. Gather photos, books, or articles about them to share with the group.

3. Set up the activity stations on different tables around the room. Allow space for 4–6 people to work at each station. Each station listed below has multiple activities and associated tent cards within it. Optional: Place the recommended book or a similar one at each station.

Station 1. Air is Everywhere

Book connection: *Air is All Around You* by Franklyn Branley

Trap the Air: Gather one or two plastic shoebox bins, clear plastic cups, paper towels, and the tent card. Fill the bins about three-quarters full with water, enough to nearly cover an upside-down cup. Tear off several sheets of paper towel to leave on the table. Pre-stuff one paper towel into the bottom of one or two of the cups and place next to the bin(s) with water (see photo). Have a trash container nearby for wet paper towels.

Bubbling Up: Gather one or two plastic shoebox bins, the clear bottles, and the tent card. Fill the tubs with enough water to submerge the bottles. Have paper towels available to clean up spills.

Crunch Time: Gather the ziplock bags, small pieces of paper, tape, permanent marker, a straw and the tent card. Put a piece of paper into each bag. Flatten one bag until there is no air inside and zip it closed. Use a piece of tape and a permanent marker to label the bag "#1". Zip the second bag nearly closed, leaving a small gap for a straw. Inflate the bag by blowing through the straw, and then remove the straw and zip it closed. Label this bag "#2" (see photo). Seal the openings of both bags with tape to prevent opening. Note: Consider making a back-up "bag #2" in case the first one breaks during the workshop.

Station 2. Air Moves Things

Book connection: *The Windy Day* by Anna Milbourne and Elena Temporin

Race the Wind: Gather the tent card, aluminum pan, toy boats, and hand-crank fan. Fill the pan with a few inches of water, enough for the boats to float without touching the bottom.

Design an Air Rocket: Gather the tent card, wide straws, thin straws, clay, several sheets of paper, 2–3 pairs of scissors, masking tape and the bullseye target. Tape the target to a wall near the station. Cut the straws in half (if not previously cut) and place the wide straws and thin straws in separate cups. Make a sample rocket by putting a small piece of clay on one end of a thin straw. Slide the thin straw inside a wider straw. Test that it works by blowing into the wider straw to launch the rocket (see photo). Write "sample" on a piece of tape and place it on the rocket to label it.

Station 3. Wind Power

Book connections: *The Boy Who Harnessed the Wind* by William Kamkwamba and Bryan Mealer; *When the Wind Blow*s by Stacy Clark

Wind Detectors: Gather the tent card, plastic pinwheel, windsock, other wind-catchers (if available), and electric fan.

Flying Colors: Gather the tent card, scissors, masking tape, craft sticks, and other materials for wind detectors. Pre-cut some strips of the ribbon, yarn, and crepe paper in varying lengths, leaving more of each for families to cut their own.

Test the Wind's Force: Gather the tent card, air cannon, large cups, copy of the Beaufort Scale, and foam or wooden blocks (if available).

Station 4. Young Scientist

Book connections: *Leaf Man* by Lois Ehlert; *Kite Flying* by Grace Lin

Leaf Blower: Gather the tent card, one or two squeeze bottles, one or two paper fans, and leaves or pre-cut leaf cutouts.

What Moves? Gather the tent card, *Does It Move in the Wind?* chart, one or two squeeze bottles, one or two paper fans and the various items to blow (feathers, blocks, etc.)

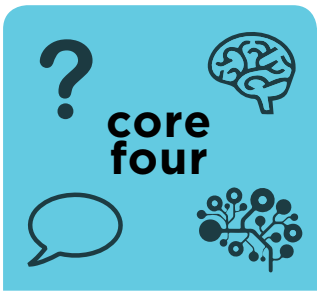
Station 5. Read and Reflect (Optional)

Read about Wind and Air: Set out the tent card and a selection of books from the Recommended Book List near a seating area for family reading.

Draw or Write about Wind and Air: Set out the tent card along with blank paper and crayons or markers on a table or other hard surface.

WELCOME (5 minutes)

- Welcome families to the workshop. Introduce yourself to the participants.
- Explain that today's workshop was developed by The Franklin Institute, a science museum in Philadelphia. The goals of the workshop are to have fun exploring wind together and to think like scientists.
- Set expectations for children's and caregivers' respective roles; for example: *Kids, you are the scientists today. Grown-ups, your job is to help your scientists—ask them questions, and let your children take the lead!*



Words in bold highlight Core Four strategies
(see pp. 5–7 for details)

ENGAGE (5 minutes)

- **Make connections** to families' everyday lives by asking about their experiences with wind. For example:
  - *What are some ways you know it is a windy day just by looking out the window?*
  - *Have you seen anything in your yard or neighborhood that moves differently on windy days?*
- Hold a pinwheel where the group can see it and blow softly on it. **Encourage scientific thinking** by asking the group to make observations and predictions:
  - *What do you notice about the pinwheel?*
  - *What could you tell about the wind if you saw the pinwheel spinning like this?*
- Next, blow hard on the pinwheel and invite the group to observe the results again. **Cultivate rich dialogue** by asking children to describe the wind.
  - *What kind of wind would make the pinwheel move like this?*
  - *How else could you describe this kind of wind?*
- Use the vocabulary cards to introduce the words **breeze** and **gale**. Invite the group to repeat each word with you, and demonstrate each one on the pinwheel as you explain that a breeze is a gentle wind and a gale is a very strong wind. **Make connections** to families' experience by referring to the words they chose to describe the wind on the pinwheel. For example, you might explain a breeze as a "soft," "gentle," or "slow" wind, depending on which words they used.
- *Optional*: Introduce the Beaufort Wind Scale chart. Explain briefly that two hundred years ago, a man named William Beaufort created this scale so that people could use the same words to talk about how strongly the wind was blowing. Meteorologists who study the weather still use the Beaufort Scale terms today to describe wind strength.
- Invite families to stand up and act like trees blowing first in a breeze and then in a gale. Be sure everyone can spread out enough to avoid hitting each other. If your space doesn't permit this, you could ask for a few volunteers to demonstrate. **Ask questions** to help them think about how the trees would move:
  - *Have you ever seen a tree move in a breeze? What does it look like?*
  - *What parts of the tree would move in a gale?*

READ: Storytime (10 minutes)

- Show the group the read-aloud book and introduce the title and author. **Encourage scientific thinking** by inviting families to make observations about the cover of the book and predictions about the story:
  - *What do you notice on the cover of this book?*
  - *What do you think this story might be about? What makes you think that?*
  - *What types of wind do you think we might find in this story?*
- Read the story, pausing to ask reflective questions about wind and air. **Encourage scientific thinking** by inviting children to observe places in the story or illustrations where objects are moving in the wind and make predictions about what will happen next. **Ask questions** like:
  - *Do you think the wind is blowing in this picture? How can you tell?*
  - *Do you think this wind is a breeze or a gale? What makes you think that?*
  - *What do you think will happen now?*
- **Make connections** between the moving objects in the book and the previous activity:
  - *What does the tree look like in this picture?*
  - *When you were acting like a tree in a gale, how did you look the same or different?*
  - *How does this object look like the pinwheel did when we blew a breeze on it?*

EXPLORE: Activity Stations (30–40 minutes)

- Invite families to explore the activities at the stations. Encourage them to work as adult-child pairs or groups. As families explore together, walk around to visit the stations and extend their learning:
- **Encourage scientific thinking** by inviting families to describe what they see, explain their thinking, or test a new idea:
  - *What do you notice about how that object is moving?*
  - *How can you make it move a different way?*
- **Cultivate rich dialogue** by encouraging conversation between adults and children as they explore the activities. Invite adults to ask their children questions from the tent cards or Question Guide. Ask children to describe to their adults what they are noticing, and what they plan to try next.
- **Make connections** by asking families to compare their observations to elements from the story or to their previous experiences:
  - *Have you ever filled a balloon with air? How can you tell when it has air in it?*
  - *How is the windsock like the kite in the story?*
  - *How is your air rocket like the sailboat at the other station?*
- **Ask questions** like the ones below to more deeply engage families in the activities. Offer additional challenges, suggest new questions to investigate, or encourage them to find an alternate way to achieve their goal.

Trap the Air

Families observe the presence of air by placing a scrunched paper towel in the bottom of a cup and placing the upside-down cup straight into a container of water.

- *What do you think will happen to the paper towel?*
- *Why do you think the paper towel didn't get wet?*
- *What do you think would happen if you tipped the cup? What makes you think so?*

Bubbling Up

Families submerge bottles of different sizes in water and observe the air bubbles that escape as the bottles fill with water.

- *What happens when you fill the large bottle compared to the small one?*
- *How could you put the bottle in the water so that no air bubbles escape?*

Crunch Time

Families compare squeezing an empty bag and an air-filled bag.

- *What do you feel when you squeeze the bags? How are they different?*
- *Which bag makes it harder to squeeze the paper inside? Why do you think that is?*

Race the Wind

Families explore moving different types of toy boats across the water using a hand-crank fan.

- *How could you make a gentle breeze to move the boat? What about a gale?*
- *Can you make your boat sail backwards?*
- *How else could you create wind to make your boat move?*

Design an Air Rocket

Families create simple air rockets from drinking straws and launch them at a target.

- *How far away from the target can you stand and still hit it with your rocket?*
- *How could you add paper and tape to your rocket to change how it flies?*

Reading Station

Families are invited to read additional books and draw or write about their experiences with wind and air.

Wind Detectors

Families test pinwheels and other premade wind-detecting devices to observe how they indicate the presence and strength of the wind.

- *How do you think that object would move in a gentle breeze? What about a gale? What makes you think so?*
- *How could you make softer or stronger winds to test that?*
- *What happens if you point the pinwheel in a different direction?*

Flying Colors

Families design and build their own wind detectors from various craft materials.

- *How could you change your detector to better show if the wind is a breeze or a gale?*
- *What do you think would happen if you used a longer piece of ribbon instead?*
- *Which materials might move in a strong wind, but not a gentle one? How could you find out?*

Test the Wind's Force

Families use an air cannon to knock over structures built from stacked cups or blocks, and reference the Beaufort Scale to label the wind strength.

- *What happens if you hold the air cannon closer or further away from your tower?*
- *What happens if you aim at the top of your tower? The middle? The bottom?*
- *Which makes a stronger tower—cups or blocks? How can you tell?*

Leaf Blower

Families use squeeze bottles and small fans (if available) to move leaves and other objects with air.

- *How could you make a gentle breeze with the bottle? What about a strong gale?*
- *How could you make that object move even further?*
- *Which of these things are easy to move by blowing? Which are harder?*

What Moves?

Families explore moving various small objects using squeeze bottles or fans and sort them into categories based on how easily they move.

- *Do you think this object will move in the wind or not? What makes you think that?*
- *Can you find a way to create wind that will make something from the "doesn't move" side move?*

REFLECT: Discussion (5 minutes)

- Gather the group and ask adults and children to reflect on their explorations. **Ask questions** like:
  - *How did you make something move using wind?*
  - *Did anything happen that surprised you? What was it?*
- **Make connections** between families' actions and scientific practices by referencing pages from the book *What Is a Scientist?* and asking them to share their own examples. **Ask questions** like:
  - *How did you feel like a scientist today?*
  - *When did you make a guess about something and test it?*
  - *Was there a time when you tried something over and over today?*
  - *Did you have fun?*
- If possible, share a photo, book, or article about a scientist whose job involves wind.
- *Optional*: Read part or all of a book that shows someone building an object to use in the wind, such as The Boy Who Harnessed the Wind by William Kamkwamba and Bryan Mealer or Francisco's Kites (Las cometas de Francisco) by Alicia Klepeis and Gary Undercuffler. **Make connections** by relating the book to families' experiences at the activity stations:
  - *How does the object in the story move in the wind?*
  - *How is it similar to something you used today? How is it different?*
- End by thanking the group for doing great work as scientists. **Encourage scientific thinking** by inviting them to continue noticing how the wind moves things outside and at home.

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Wind Family Workshop Question Guide

Here are some key questions you can ask to guide children's explorations during the workshop.

WORKSHOP SECTION	ASK
ENGAGE: Breeze and gale	*What are some ways you know it is a windy day just by looking out the window?* *Have you ever seen a tree move in a breeze? What does it look like?* *What parts of a tree would move in a gale?*
READ: Storytime	*What do you think this story might be about? What makes you think that?* *Do you think this wind is a breeze or a gale? What makes you think that?* *What do you think will happen now?*
EXPLORE: Wind station activities	*Why do you think the paper towel in the cup didn't get wet?* *How could you put the bottle in the water so that no air escapes?* *What do you feel when you squeeze the two bags? What is different about them?* *How else could you create wind to make your boat move?* *What could you add to your rocket? How do you think that will change how it flies?* *How could you change your detector to better show the difference between a breeze and a gale?* *How could you make that object move even further?*
REFLECT: Group discussion Read *What Is a Scientist?* Introduce a scientist	*How did you make something move with wind?* *Did anything happen that surprised you? What was it?* *How did you feel like a scientist today?*

To find out more about The Franklin Institute and Leap into Science, visit leap.fi.edu.

Recommended Book List

*Asch, Frank & Asch, Devin (2008). *Like a Windy Day*. Sandpiper. ISBN-13: 978-0152064037.

Beaty, Andrea and David Roberts (2016). *Ada Twist*, Scientist. Harry N. Abrams. ISBN-13: 978-1419721373.

Benduhn, Tea. (2008). *Wind Power/Energia del Viento*. Weekly Reader Early Learning. ISBN-13: 978-0836893649.

Branley, Franklyn M. & O'Brien, John (2006). *Air Is All Around You*. HarperCollins. ISBN- 13: 978-0060594152.

Clark, Stacy & Sneed, Brad (2015). *When the Wind Blows*. Holiday House. ISBN-13: 978-0823430697.

Cobb, Vicki & Gorton, Julia (2003). *I Face the Wind*. HarperCollins. ISBN-13: 978-0688178413.

Cole, Joanna (1996). *The Magic School Bus: Inside a Hurricane*. Scholastic. ISBN: 0590446878.

Derby, Sally & Nguyen, Vincent (2013). *Whoosh! Went the Wind*. Two Lions. ISBN-13: 978-1477816776.

Dorros, Arthur (1990). *Feel the Wind*. Collins. ISBN-13: 978-0064450959.

Drummond, Alan. (2015). *Energy Island: How One Community Harnessed the Wind and Changed Their World*. Square Fish. ISBN-13: 978-1250056764.

*Ehlert, Lois (2005). *Leaf Man*. Harcourt Children's Books. ISBN-13: 978-0152053048.

*Ets, Marie Hall (1978). *Gilberto and the Wind/Gilberto y el Viento*. Puffin. ISBN-13: 978-0140502763.

*Hutchins, Pat (1993). *The Wind Blew*. Aladdin. ISBN-13: 978-0689717444.

*Kaner, Etta & Lafrance, Marie (2006). *Who Likes the Wind?* Kids Can Press. ISBN-13: 978-1553378396.

Klepeis, Alicia Z. & Undercuffler, Gary (2015). *Francisco's Kites/Las Cometas de Francisco*. Pinata Books. ISBN-13: 978-155858046.

Kamkwamba, William & Mealer, Bryan (2012). *The Boy Who Harnessed the Wind*. Penguin Group. ISBN-13: 978-0803735118.

*Lehn, Barbara. (1999). *What Is a Scientist?* Millbrook Press. ISBN-13: 978-0761312987.

*Lin, Grace (2002). *Kite Flying*. Dragonfly Books. ISBN-13: 978-0553112542.

Malone, Peter (2007). *Close to the Wind: The Beaufort Scale*. G. P. Putnam's Sons. ISBN-13: 978-0399243998.

Recommended Book List

Milbourne, Anna & Temporin, Elena (2007). *The Windy Day*. Usborne Books. ISBN-13: 978-0794516161.

*Scanlon, Liz Garton & White, Lee (2018). *Kate, Who Tamed the Wind*. Schwartz & Wade. ISBN-13: 978-1101934791.

*Sweeney, Linda Booth & Christy, Jana (2015). *When the Wind Blows*. G. P. Putnam's Sons. ISBN-13: 978-0399160158.

*Wolff, Ferida (2005). *It is the Wind*. HarperCollins. ISBN-13: 978-0060281922

**Appropriate for early learners up to age five.*

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Materials List

Right-hand columns indicate which workshops require the materials: Preschool (P), Elementary (E), Family (F). In cases where specific materials are not available, materials with a comparable purpose (such as other small objects for blowing with squeeze bottles) may be substituted.

NON-CONSUMABLES	P	E	F
Kate, Who Tamed the Wind by Liz Garton Scanlon (1)	X	X	X
The Wind Blew by Pat Hutchins (1)	X		
What Is a Scientist? by Barbara Lehn (1)	X	X	X
Plastic squeeze bottles, 16 oz. (15)	X		X
Pompoms, approx. 3/8″ (30)	X		X
Electric fan, 11” or larger (1–2)	X	X	X
Wooden blocks (15–20)	X		X
Plastic pinwheel (1)		X	X
Decorative windsock (1)		X	X
Air cannon (1)		X	X
Child-safe scissors (1 per 3–4 children)		X	X
Beaufort Wind Scale, printed on heavy cardstock+		X	X
Plastic bins, shoebox size (2)			X
Clear plastic cups, 8-oz (18)			X
Small, clear bottles, various sizes (3)			X
Ziplock bags, quart or gallon size (3)			X
Permanent marker (1)			X
Aluminum foil roasting pan, 9″ x 12″ or larger (1)			X
Plastic toy boats, 3″– 5″ length; 1 sailboat + 2 other boat types			X
Personal hand-crank fan (1)			X
Bullseye target, printed on heavy cardstock+			X
Does it Move in the Wind? chart, printed on heavy cardstock+ (1)			X
Leaves gathered from outdoors or cut from paper template+	X		X
Tent cards, printed on heavy cardstock+			X
Breeze word card, printed on heavy cardstock+	X	X	X

(continued on next page)

+See Printable Resources section

Gust word card, printed on heavy cardstock+	X		
Gale word card, printed on heavy cardstock+		X	X

CONSUMABLES	**P**	**E**	**F**
Wooden craft sticks (1 per child)	X	X	X
Crepe paper (1 roll)	X	X	X
Ribbon (1 roll)	X	X	X
Craft feathers (4–6 per child)	X	X	X
Coffee filters (1–2 per child)	X	X	X
Tissue paper (1 sheet per child)	X	X	X
Chenille stems (1–3 per child)	X	X	X
Construction paper (1 sheet per child)		X	X
Paper clips (3–5 per child)	X	X	
Unsharpened pencils (1 per child)		X	X
Push pins (2–3 per child)		X	X
Brown paper bags (1 per child)		X	X
Paper cups, 3-oz. (2–4 per child)		X	X
Masking tape (2 rolls)	X	X	X
Paper towels (1 roll)			X
Water			X
Wide drinking straws (1 per 2 children)			X
Standard drinking straws (1 per 2 children)			X
Modeling clay (1/4" ball per child)			X

OPTIONAL ADDITIONAL MATERIALS	**P**	**E**	**F**
Large foam board or tray	X		
Additional small items for blowing, such as Styrofoam balls, small plastic toys, etc.	X		X
Blank paper for drawing/writing	X	X	X
Crayons, markers, and/or pencils	X	X	X
Photo, book, or article about a scientist whose job involves wind	X	X	X
Images or video clips of devices that measure or move in the wind		X	
Additional personal fans, battery-operated or hand-crank	X		X
Additional pinwheels, windsocks, or other wind-catching devices	X	X	X
Additional wind books (see Recommended Book List)	X	X	X

**Consumable if children take them home; otherwise reusable*

+See Printable Resources section

Standards Alignment

NEXT GENERATION SCIENCE STANDARDS

Disciplinary Core Ideas:

- ESS2.D, Weather and Climate: *Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time.*

Science and Engineering Practices:

- Asking Questions and Defining Problems
- Planning and Carrying Out Investigations
- Analyzing and Interpreting Data
- Constructing Explanations and Designing Solutions
- Engaging in an Argument from Evidence

Crosscutting Concepts:

- Patterns: *Patterns can be observed and used to make predictions.*
- Cause and Effect: *Tests can gather evidence about cause-and-effect relationships.*
- Structure and Function: *The shape and stability of structures are related to their functions.*
- Stability and Change: *Systems may be stable under some sets of conditions and change under others.*

COMMON CORE STATE STANDARDS

English Language Arts Standards:

- CCSS.ELA-Literacy.SL.K-5.1: *Engage in collaborative conversations with diverse partners about age-appropriate topics.*
- CCSS.ELA-Literacy.L.K-5.5: *With guidance and support from adults, explore word relationships and nuances in word meanings.*
- CCSS.ELA-Literacy.L.K-5.6: *Use words and phrases acquired through conversations, reading and being read to, and responding to texts.*

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breeze

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gust

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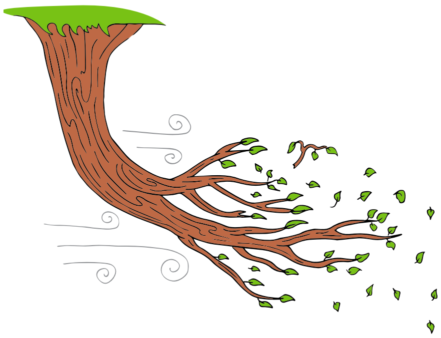

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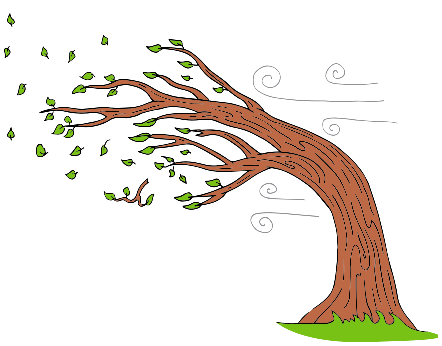

gale


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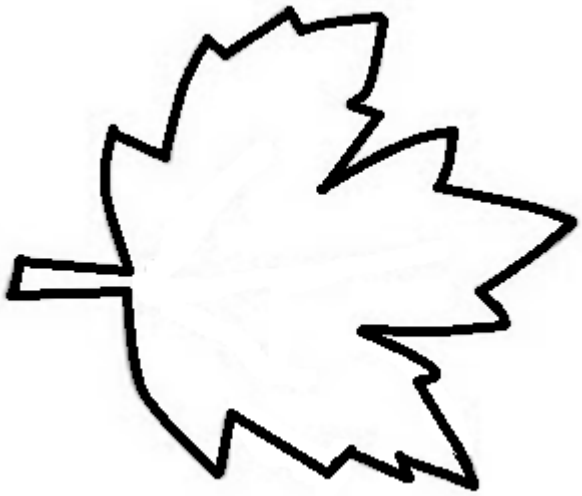
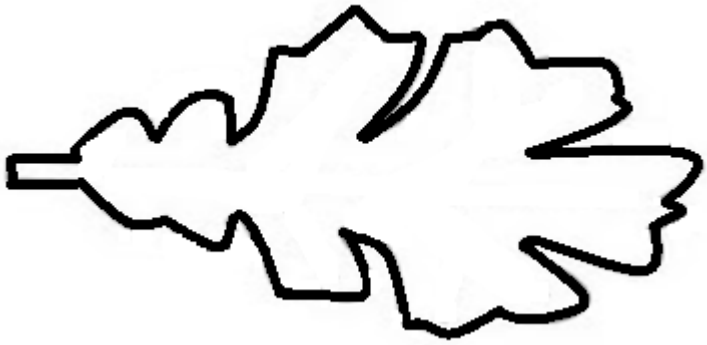
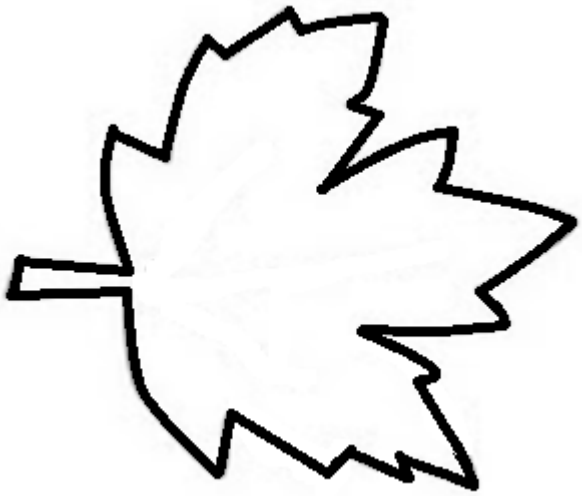
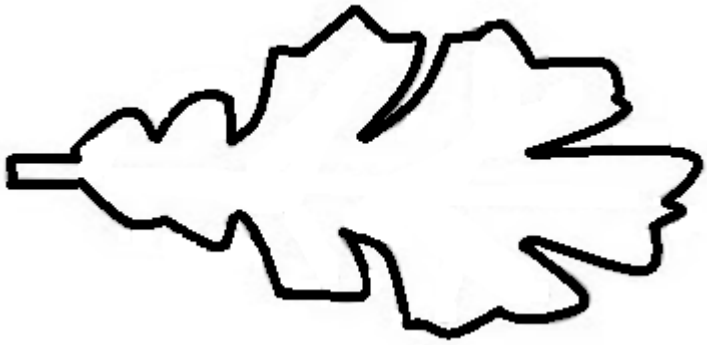
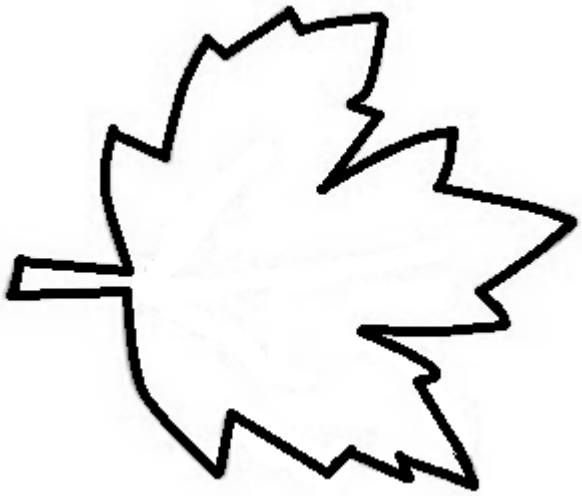
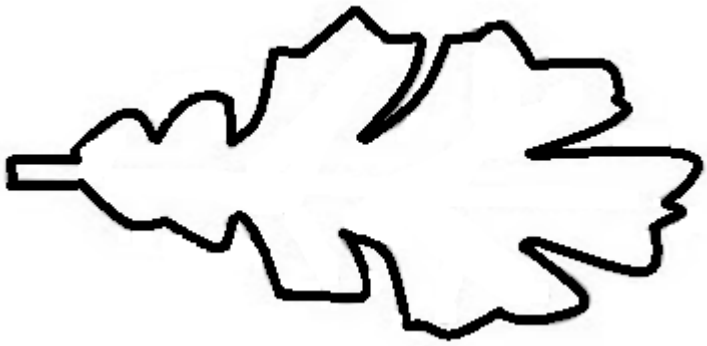












BEAUFORT WIND SCALE: ON LAND

CATEGORY		SPEED	EFFECTS
0	CALM	Less than 1 mile per hour	On land, everything is still.
1	LIGHT AIR	1–3 miles per hour	Wind blows smoke, but not a weather vane.
2	LIGHT BREEZE	4–7 miles per hour	Leaves on trees rustle, wind is felt on skin, and weather vanes move.
3	GENTLE BREEZE	8–12 miles per hour	Leaves and small twigs move. Light flags wave.
4	MODERATE BREEZE	13–18 miles per hour	Leaves, twigs, and small branches move. Dust and loose paper blows around.
5	FRESH BREEZE	19–24 miles per hour	Small leafy trees begin to sway. Hats will blow off in the wind.
6	STRONG BREEZE	25–31 miles per hour	Large branches begin to move. Umbrellas are hard to use if it's raining.
7	NEAR GALE	32–38 miles per hour	Whole trees move. Walking against the wind is hard.
8	GALE	39–46 miles per hour	Twigs break off of trees. Cars are pushed around on the road.
9	STRONG GALE	47–54 miles per hour	Large branches break. Small trees may blow over and construction signs and barricades blow over.
10	STORM	55–63 miles per hour	Trees break off or uproot, and saplings bend over. Shingles may blow off rooftops.
11	VIOLENT STORM	64–75 miles per hour	There is lots of damage to trees, and some structures and rooftops may be damaged.
12	HURRICANE	Over 75 miles per hour	Heavy damage happens to trees and buildings.

Reference: National Weather Service Storm Prediction Center

Does it Move in the Wind?
¿Se mueve en el viento?

Yes, it moves:
Sí, se mueve:

No, it does not move:
No, no se mueve:

Estación 1:
El aire está en todas partes

Fold Here

Station 1:
Air is Everywhere

Atrapar el aire

Arruga una toalla de papel en la parte inferior de un vaso.

Pon el vaso boca abajo y colócalo de manera derecha en el agua. ¡No inclines el vaso!

Levántalo sin dejarlo caer.

¿Qué observaste con respecto a la toalla de papel?

¿Qué crees que pasó?

Fold Here

Trap the Air

Crumple a paper towel in the bottom of the cup.

Turn the cup upside down, and put it straight down into the water. Don’t tip the cup!

Bring it back up without letting go.

What do you notice about the paper towel?

Why do you think that happened?

Burbujear

Sostén una botella vacía debajo del agua para llenarla.

¿Qué puedes observar?

¿Qué forma las burbujas?

Fold Here

Bubbling Up

Hold an empty bottle under the water to fill it up.

What do you notice?

What's making the bubbles?

Hora de triturar

Intenta apretar el papel enla bolsa n.º 1.

Ahora intenta hacerlo enla bolsa n.º 2.

¿Cuál es la diferencia?

¿Por qué?

Fold Here

Crunch Time

Try to squeeze the paper in bag # 1.

Now try bag # 2.

What is the difference?

Why do you think that?

Estación 2: El aire mueve las cosas

Fold Here

Station 2: Air Makes Things Move

Carrera contra el viento

Utiliza el ventilador para soplar los barcos por el agua.

¿Qué barco es el más fácil de mover con el viento?

¿Cómo puedes hacer que se mueva mucho más rápido?

Fold Here

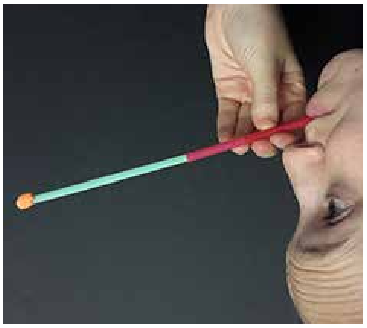
Race the Wind

Use the fan to blow the boats across the water.

Which boat is easiest to move with wind?

How can you make it move even faster?

Diseñar un cohete aéreo



Coloca un pedacito de arcilla en la parte superior del popote fino.

Desliza el popote fino dentro del popote más ancho.

¡Sostén el popote más ancho, y sopla por dentro para lanzar el cohete!

¿Cómo puedes cambiar tu cohete para que vaya aún más rápido?

Fold Here

Design an Air Rocket

Put a piece of clay on top of a thin straw.

Slide the thin straw into the wider straw.

Hold the wider straw, and blow into it to launch your rocket!

How can you change your rocket to go even farther?

Estación 3:
Energía eólica

Fold Here

Station 3:
Wind Power

Detector de viento

Prueba los objetos poniéndolos frente al ventilador.

Intenta subir o bajar la velocidad del ventilador.

Intenta mover el objeto más cerca o más lejos del ventilador.

¿Cómo muestra el objeto que hay viento?

¿Qué pasa cuando cambia el viento?

Fold Here

Wind Detector

Test the objects by putting them in front of the fan.

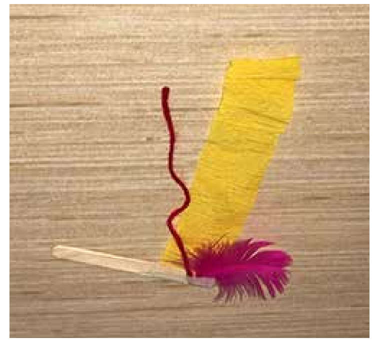
Try turning the fan speed up or down.

Try moving the object closer or further from the fan.

How does the object show that wind is blowing?

What happens when the wind changes?

Colores de vuelo



Haz un objeto que detecte cómo sopla el viento.

Pon a prueba tu objeto soplándolo.

Prueba tu objeto poniéndolo frente a un ventilador a diferentes velocidades.

¿Qué notaste?

¿Tu objeto se mueve de manera diferente en vientos suaves y fuertes?

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Fold Here

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Flying Colors

Make an object that detects how the wind is blowing.

Test your object by blowing on it.

Test your object by putting it in front of a fan at different speeds.

What do you notice?

Does your object move differently in gentle and strong winds?

Probar la fuerza del viento

Construye una torre con vasos o bloques.

Apunta el cañón de aire a la torre.

Tira del cañón de aire y deja que se vaya.

¿Puede construir una torre que se quede a pesar del viento?

¿Qué tan fuerte es el viento? Mira la escala de Beaufort para decidir.

Fold Here

Test the Wind's Force

Build a tower with cups or blocks.

Aim the air cannon at your tower.

Pull on the air cannon and let it go!

How can you build a tower that stays up in the wind?

How strong is the wind? Look at the Beaufort scale to decide.

Estación 4:
Joven Científico

(Adecuado para niños de entre 3 y 5 años)

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Fold Here

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Station 4:
Young Scientist

(Designed for children ages 3–5)

Soplador

Usa un ventilador o una botella para apretar para soplar las hojas por la mesa o el piso.

¿Qué tan lejos puedes hacer que se muevan?

Fold Here

Leaf Blower

Use a fan or squeeze bottle to blow the leaves across the table or floor.

How far can you make them move?

¿Qué se mueve?

Sopla suavemente los objetos con el ventilador o presiona una botella.

Coloca los objetos en el cuadro según cómo se mueven.

¿Qué pasa si soplas más fuerte?

¿Cómo podría cambiar un objeto de "No" a "Sí"?

Fold Here

What Moves?

Gently blow the objects with the fan or squeeze bottle.

Place the objects on the chart based on how they move.

What happens if you blow harder?

How could you change an object from "No" to "Yes"?

Estación 5: Lee y Refleja

Fold Here

Station 5: **Read and Reflect**

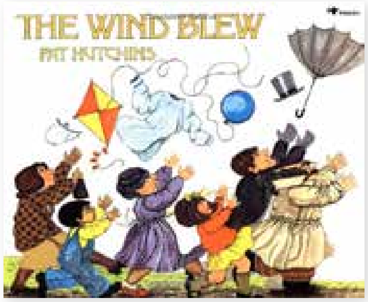
Lee sobre el Viento

¡Lee estos libros para obtener más información sobre el viento!

¿Dónde ves que el viento está ocurriendo en los libros?

Fold Here

Read about Wind



Read these books together to learn more about wind.

Where do you see wind happening in the books?

Dibuja y Escribe sobre el Viento

Dibuja una imagen o escribe una historia, una canción o un poema sobre el viento.

¿Qué hiciste hoy para explorar el viento?

Fold Here

Draw and Write about Wind

Draw a picture or write a story, song, or poem about wind.

What did you do today to explore wind?