THE SCIENCE OF SOCCER

ENGINEERED BY THE FRANKLIN INSTITUTE

Activity 2

ON THE FIELD

Activity 2: **On The Field**

Audience: Children ages 6-10

Time Frame: 30-45 minutes

Summary: In this activity, learners become soccer scientists to investigate how weather and field conditions affect the motion of a soccer ball. Using a miniature soccer field, teams will test how a ball moves on different surfaces and under changing "weather effects," then strategize how to score goals even when conditions make it tough to play.

Guiding Questions:

- How do field conditions affect the way a soccer ball moves?
- How do players adjust their strategies when the field or weather changes?
- What can experimenting like scientists teach us about sports?

Science Concepts:

Force: A push or pull that can make something start moving, stop moving, or change directions.

Motion: The way something moves from one place to another.

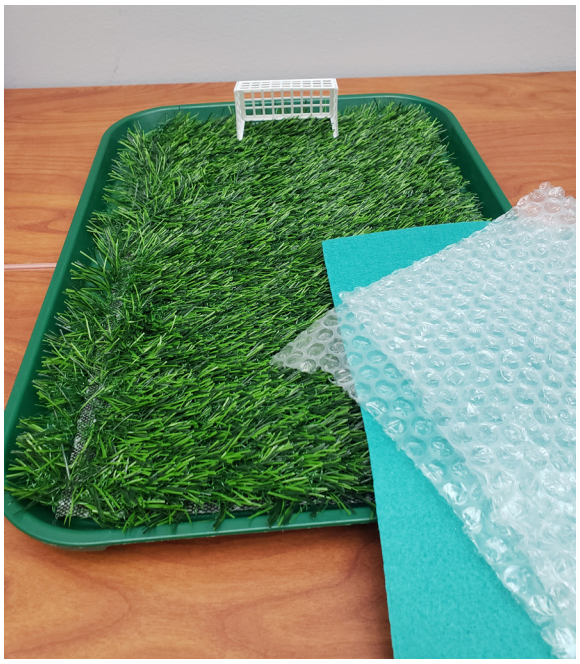
Friction: The force that resists sliding between two surfaces.

Air resistance: A type of friction that happens when air pushes against something moving through it. It slows things down.

For more information about these concepts, see the Background section at the end of this guide.

MATERIALS

- Large plastic tray (1 per group of 3-4 learners)
- Mini soccer net (1 per group)
- Mini soccer feet (2 sets per group)
- Mini soccer ball (1 per group)
- Hand fan (1 per group)
- Turf pad (1 per group)
- Felt sheet (1 per group)
- Sandpaper sheet (1 per group)
- Bubble wrap sheet (1 per group)
- Scissors (for educator use)
- Masking tape
- *On the Field* photo printouts
- Optional: Internet access, computer and screen for showing video clips



SET-UP

1. Print copies of photos, if necessary.
2. As needed, trim sheets of felt, sandpaper, bubble wrap, and turf to fit the size of the tray bottom.
3. Prepare sets containing one piece of each material (one per group of 3-4 learners).
4. Set up soccer field models (one per group of 3-4 learners):
   - Place a mini goal at one short end of each tray.
   - Check that all trays are placed on level surfaces to ensure consistent ball movement.
5. Where possible, set up video equipment and cue up one or more of the video clips listed in the Video Resources section at the end of this guide.

ENGAGE (10 MIN)

1. Gather the group and show images or short video clips (*if possible*) of soccer players in different weather conditions and field conditions. Ask:
   - What sport do you think this is?
   - What comes to mind when you think about soccer?
   - Who has played or watched soccer before?
2. Ask the group guiding questions:
   - Where is soccer usually played? (Mostly outdoors)
   - What surfaces is soccer played on? (Grass, turf, dirt, indoors sometimes)
   - What kinds of weather can happen during a soccer game?
   - How might field conditions affect how the ball moves and how players play?
3. Explain that every move involves **force** and **motion** to make the ball behave in different ways. Describe that a force is a push or pull and force makes things move or stop. And it's not just the players who push or pull the ball; the ground and air can too!
4. Explain that today they're going to be soccer scientists to find out how field conditions like wind or the type of surface change how the ball moves. Instead of using a full soccer field, they will use a **model**, a smaller version that represents the real game, to test and explore how things work.

You may want to mention that in 2026, the US, Mexico, and Canada are hosting the Men's World Cup, where men's soccer teams from countries across the world come to compete for the title of World Cup Champion. The next Women's World Cup will take place in Brazil in 2027.

EXPLORE (20-30 MIN)

1. Divide learners into teams of 3-4 and distribute Part 1 of the challenge materials.
   - Tray with mini soccer goal (1 per group)
   - Mini soccer ball (1 per group)
   - Mini soccer feet (2 sets per group)
   - Surface swatches (turf, felt, sandpaper, bubblewrap)
2. Explain to learners that in the first part of the experiment, they will test how the ball moves on different surfaces. Hold up the different materials and ask learners what kind of real-life field they might represent:
   - Turf – long grass
   - Felt – short grass
   - Sandpaper – asphalt or cement
   - Bubble wrap – bumpy, uneven ground
3. Direct learners to:
   - Begin with the plain plastic tray surface.
   - Take turns tapping the ball lightly toward the goal. Try to keep the force of their kick about the same each time.
   - Repeat the test at least 3 times, then talk about how far the ball went.
   - Swap in different surface swatches (turf, felt, sandpaper, bubblewrap) and repeat the same procedure.
   - Afterward, try a few "hard" vs. "soft" kicks on each surface to see how the amount of force changes the results.
   - Compare what they notice: Which surfaces slow the ball the most? Which ones let it roll farther?

> As they experiment, encourage learners to give each member of their team a chance to test kicking the ball.

4. Ask learners guiding questions:
   - Which surface made the ball roll the farthest?
   - Which surface slowed it down the most?
   - Which was easiest or hardest to control?
   - How did you have to kick differently on long grass versus short grass versus bumpy ground?
5. Now explain that they will be adding a weather element to the experience – wind. Distribute the hand fans and demonstrate how to use them.
6. Direct learners to:
   - Choose one surface (plastic tray, felt, turf, sandpaper, or bubblewrap) to start.
   - Try scoring while a teammate uses the fan to create wind. Experiment with blowing against the ball, with the ball, and from the side.
   - Notice what happens: Does the ball slow down, speed up, or curve away?
   - Talk about how they had to adjust their kick—harder, softer, or aiming differently—to still reach the goal.
   - Swap in other surfaces and repeat to see how wind and surface interact together.
7. As learners are experimenting, ask guiding questions like:
   - How did the ball move differently in the wind?
   - How did the direction of the wind change how the ball moved?
   - How did you change your strategy to score a goal?

REFLECT (5 MIN):

1. Gather learners to share their results.
   - Which surface made it easiest to score? Which was hardest?
   - How did the wind change the ball's movement?
   - If you were a coach, what would you tell your players to do differently in these different field conditions?
2. Discuss how students felt like scientists. Ask:
   - How did you feel like a scientist?
   - How did experimenting help you learn something new about soccer?
   - If you were designing a new soccer field, which surface would you choose and why?

BACKGROUND

Soccer is played on different surfaces like grass, turf, dirt, and even indoor floors. The textures of different surfaces create different amounts of friction with the ball, which affects how fast and far the ball rolls across the surface.

Each surface also reacts differently to weather events like rain and wind. Rain reduces friction, making fields slippery and speeding up the ball, while wind can push the ball off course, making passes and shots less predictable. Players and coaches adapt by using shorter passes, aiming lower, or shifting formations.

In this activity, you'll help learners connect their play to science ideas. They'll explore **friction** by testing how the ball moves on different surfaces, investigate force and motion by kicking harder or softer, and notice **air resistance** as wind changes the ball's path.

By experimenting with different surfaces and weather conditions, children can see how real soccer players adjust their strategies and how physical science concepts play out in everyday games.

VIDEO RESOURCES:

Soccer in the wind:

https://www.youtube.com/watch?v=CuVEcE7r1E4

Men's Soccer Highlights:

https://www.youtube.com/watch?v=aTTOQtSOX3I

Women's Soccer Highlights:

https://www.youtube.com/watch?v=m5IXs5ASt3c