

***The goal of these modules is to look at your world differently: How do you determine which ball to use for a sport?***

**Lesson Title: Exploring the Wonders of Balls in Sports!**

**Video:** <https://youtu.be/Yc-IB0aZxJs?si=KAFrpuq8NRPNe9QF>

**Duration:** [one hour]

***Application to the real world: New sports have been created, popularized and even have leagues. Can you invent the sport to take the country by storm?! Can you revolutionize the game of basketball by creating an improved basketball?***

**Objective:** Introduce participants to the basic concepts of [Topic] through engaging hands-on activities, fostering curiosity and understanding in informal science settings.

**Materials Needed (links to amazon or vendor supplies):**

- a variety of balls that bounce, roll, have different textures, and ones that are different sizes Examples: basketball, soccer ball, volleyball, pool ball, beach ball, tennis ball, kickball, foam balls, nerf balls, golf balls, etc.
- ramp (homemade or purchased) or use a hill or defined area that goes from high to low (sliding board)
- varied spaces to roll a ball (grass/turf/carpet), hard floor)
- container or area to catch ball once it is tossed or kicked (bucket, hoop, or simply toss to another person)
- yardstick or measuring tape affixed to a surface (use to measure height ball bounces to)

**Cost estimate:**

**Hook:**

What is something that has no edges or corners, can be used to enhance hand-eye coordination, and can be used to entertain or train a person?

**Introduction:**

1. Balls are one of the most used objects in the world. There are so many ways to apply their use; they are used by babies to promote sensory and auditory stimulation, athletes use them to play sports, scientists use them in engineering products.

Combining the fascinating science behind balls and the thrill one feels when playing a game, it is easy to see why new ball games are being created frequently. Some games become so popular that they achieve notoriety in the professional world.

2. The shape of the ball can affect what it is used for, especially in sports. Once a sport is defined, you can figure out which ball suits its needs the best. New sports are being created all the time. Having the perfect ball is vital for both enjoyment and practicality of the game. If the ball is not suited for the game, it ruins the potential fun that was intended.

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3. "Today, we will embark on a journey to explore the fascinating world of sports and balls through interactive experiments and activities!"

**Activity: Reverse Engineer a Game**

Students will reverse engineer a game by examining the characteristics of balls and their use in various sports.

*Reverse engineering is the process of analyzing a product, system, or piece of technology to understand how it works, its design principles, and its components. This is done by dissecting, deconstructing, and examining the object of interest in order to gain insights into its inner workings, structure, and functionality. Materials scientists and engineers identify the properties of many different materials and recommend their best uses. This activity demonstrates reverse engineering, in which the properties of finished products are determined by performing tests on the products. (Lesson explanation and inspiration from Teach Engineering: Reverse Engineering Ball Bounce Experiment*

[https://www.teachengineering.org/activities/view/ball\\_bounce\\_experiment](https://www.teachengineering.org/activities/view/ball_bounce_experiment)

What are students doing in this module?

Students will behave as material scientists by performing tests on a variety of balls to determine their characteristics.

In small groups, students will examine different balls and fill out their characteristics on a worksheet/chart paper/white board. Encourage them to investigate and think about all the different components of the ball – what is it made from, how well does it bounce, how large is it, etc.

**Outline of Activity:**

1. Have testing stations set-up to assist students with defining characteristics (space to roll on different surfaces, ramp (optional), space to bounce and space to toss. Testing can be completed in one area or to increase movement, students could rotate around a space to test (ex: roll station, bounce station, tossing station, comparing materials station, what's inside the ball station (optional if you are willing to split open balls or have copies of the inside of various balls).

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Sample Chart set-up:

## Characteristics of Balls

Name \_\_\_\_\_

<b>BALL</b>	<b>MATERIAL</b>	<b>SIZE</b>	<b>COMPOSITION</b>  <b>(HOLLOW OR SOLID)</b>	<b>WEIGHT</b>  <b>(HEAVY OR LIGHT)</b>	<b>BOUNCE HEIGHT</b>  <b>(in cm or ft)</b>

2. Last phase is to have each group pick a sport and pick a ball not usually used in that sport. Create a new game using the ball selected. Select some of the rules from the sport the group identified. Then find ways to use both the ball and the rules to play the new game.
3. Demonstrate to the whole group how to play your new game and explain how the use of the ball was determined.

*Outline to follow as lesson is delivered:*

1. Provide a clear explanation of the activity's purpose and goals.
2. Demonstrate the step-by-step procedure of the activity.
3. Allow participants to follow along and perform the activity themselves.
4. Encourage participants to ask questions and make observations during the activity.
5. Discuss the science behind the activity, emphasizing key concepts and principles.
6. Foster a sense of exploration by prompting participants to think creatively and make predictions.
7. Relate the activity to real-life applications or phenomena related to characteristics of balls and sports.
8. Address any misconceptions that may arise during the activity.
9. Discuss the outcomes of the activity and how they relate to the principles of characteristics of balls and sports .
10. Engage participants in a reflective discussion about the overall experience and newfound knowledge.

*Conclusion:*

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1. Summarize the key takeaways from each activity, reinforcing the core concepts of characteristics of balls and sports.
2. How do you see your world differently now?
2. Encourage participants to continue exploring and experimenting with characteristics of balls and sports in their daily lives.
3. Provide additional resources, such as books, websites, or community events, for further learning.
4. Express gratitude for participants' engagement and curiosity, emphasizing the importance of informal science exploration.

*Extensions (how to scale for your child's grade level):*

1. Suggest variations or more advanced activities for participants who want to dive deeper into characteristics of balls and sports  
**Primary-** Only perform the bounce and the roll tests. Have them discuss the characteristics and the leader will write the information into the chart. Give everyone the same sport for the last phase. Give them a new ball for the sport and ask them to add a rule to the game using one of the cool characteristics of their new ball (ex: if we use a soccer ball for a basketball game then we can headbutt the ball into the goal)

Additional Primary suggestions from

<https://www.lakecountyschools.net/thecenter/2019/10/25/preschoolers-begin-balls-study-in-creative-curriculum/>

What You Can Do at Home

Spend time with your child, playing with balls of all shapes, types, and sizes, such as playground balls, tennis balls, table tennis balls, Koosh<sup>®</sup> balls, volleyballs, baseballs, footballs, and marbles. Talk about what the balls are made of, whether they are heavy or light, and whether they are big or little.

Wonder aloud with your child to encourage his or her thinking about balls. For example, you might ask, "I wonder what's inside a tennis ball. I wonder how far you can throw a foil ball, a beach ball, or a tennis ball. How can we find out?"

Help your child use all of his or her senses when playing with balls. You might ask, "What does it look like? Feel like? Sound like? Smell like?"

See how many types of balls you can find around the house and in your neighborhood.

Play a game while riding in the car, bus, or train. Think of all the words that contain the word ball in them. Look for examples of balls around you.

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**Intermediate-** Make new rules for a new game. Pick a sport and a ball option out of a cup and use the information to create a new game. Then demonstrate how to play the game. Students can learn how to design experiments. Instead of setting up stations, you can allow students to develop their own tests based on questions they want answered about balls. (ex: What's inside a ball? Do all balls bounce? Which balls bounce better? How far can I throw different kinds of balls? Which balls roll the fastest? Can I make a ball?)

**Advanced (High School)-** Make an adaptation to a game for a person with a vision impairment. How would you alter a ball to make it useful for this person? If allowed, demonstrate changes with crafting supplies and explain how each change would be beneficial. Cite evidence from what was learned about the materials and compositions of various balls. If you add something different to the ball, explain your reasoning.

Offer opportunities for participants to share their own discoveries and experiments with the group.

2. Provide guidance on how participants can connect with local science enthusiasts or organizations for ongoing learning.

*Ideas: Local universities have individuals that study materials and their functions. See if a professor, PhD student is interested in speaking with students.*

*If students are still interested in exploring balls, here are some suggestions from [https://ocw.umb.edu/early-education-development/eec-preschool-learning-standards-and-guidelines/science-module-readings/CC%20StudyStarter%20Balls.pdf/at\\_download/file.pdf](https://ocw.umb.edu/early-education-development/eec-preschool-learning-standards-and-guidelines/science-module-readings/CC%20StudyStarter%20Balls.pdf/at_download/file.pdf)*

***Further Questions to Investigate***

*You may notice that children are still engaged in the study and want to find out more. Here are some examples of additional questions you might investigate to extend the study further:*

- *What defines a ball as a ball?*
- *If a ball is placed in a freezer, will it bounce higher?*
- *How many ways can we make our own balls? Will they bounce?*
- *Which balls can I throw, kick, or roll the longest distance?*
- *What are the favorite games our families like to play that use balls?*
- *What are the favorite ball games our families like to watch?*
- *How do basketball players spin balls on their fingers?*
- *What kinds of balls do different kinds of pets like?*
- *Do all balls roll?*
- *What kind of ball games do children in other communities play?*
- *How many different kinds of balls can we make?*
- *How does a ballpoint pen work?*
- *Can balls be used in decorations? In artwork? In structures?*
- *How are bubbles the same as or different from other types of balls?*

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**Feedback from participants:**

- 1. How did you incorporate spirituality/faith into this lesson**
- 2. What feedback do you have**