



K-2: Sports Challenge

Curriculum Connections

Physical Sciences Concepts

- Begin to investigate variables, such as shape, material, and mass, and how they may affect an object's properties.
- Observe and describe the position, direction, and motion of objects, such as on top of, next to, over, under, slide, and roll.
- Begin to investigate how various forms of energy and different forces interact with objects and properties.

Scientific Connections and Applications

- Become aware of and describe the importance of science and scientists in their world.

Scientific Thinking

- Begin to ask questions and construct explanations based on observations of objects and events.

Scientific Communication

- Acquire information from observation, experimentation, print and non-print sources.

** Based on the New York State Elementary Science Core Curriculum and the New York City New Standards™*

National Standards

Content Standard A: Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

Content Standard B: Physical Science

- Properties of objects and materials
- Position and motion of objects

K-2 Exhibits List

Wider is Better -- The Balance Challenge

And they're Off! -- The Reaction Time Challenge

Flaming Fastballs -- The Pitching Challenge

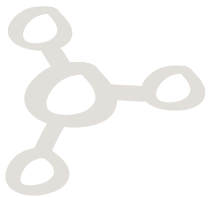
Get a Grip! -- The Climbing Challenge

Go Speed Racer! -- The Race Challenge

Take a Leap -- The Leap Challenge

That's the Way the Ball Bounces -- The Bounce Challenge

Hit the Spot -- The Trajectory Challenge





K-2: Sports Challenge

Guide Theme

The theme of these guides are based on popular crime and detective show investigations on TV; a mystery unfolds, questions are asked, evidence is gathered, conclusions are drawn. This process is similar to what scientists go through with the inquiry method. For more details see About the Guides.

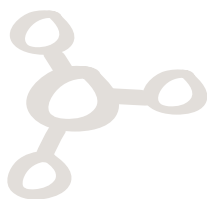


Begin the Investigation At School

A mystery unfolds, questions are asked...

There are several ways you can introduce the topic and start the investigation. Here are some ideas that will help students start thinking about the topic and generate questions:

- Create a mystery about how arms can help you jump higher. (Mystery solved at The Leap Challenge exhibit)
- Create a mystery about an auto race where the fastest driver to start didn't win the race. (Mystery solved at Reaction Time Challenge exhibit)
- Demonstrate one of the Laboratory Activities with no explanation-let the questions begin
- Do one of the Laboratory Activities and facilitate a probing discussion



Prepare for Investigation at the New York Hall of Science

Once students have generated questions around the topic tell them they are going to continue the investigation at the New York Hall of Science.

At this point you may want to begin one of the Continuum Activities. These activities have the following features:

- Vary in length and depth
- Provide continuity and purpose for the visit
- Provide a way of assessing student understanding

Orientation and Planning: If you do nothing else, do this!

Here are five reasons to conduct student orientation and planning before going on a field trip:

1. Students focus on exploring and investigation versus the novelty of the location
2. Students don't have to worry about logistics like restrooms, schedule, eating etc.
3. Students who understand the plan and purpose of the visit are more likely to stay focused
4. Students who have clear goals for their visit are less likely to race from one exhibit to another with little understanding
5. Students who get involved in the planning of the visit, take ownership and are less likely to misbehave



Read more about the Orientation and Planning Process

Investigation at the New York Hall of Science

Evidence is gathered...

Okay. The class has arrived at the next phase of the investigation. The students have questions and seek answers. Everyone knows what exhibits they should visit and why. Everyone knows the schedule for the day. Students have materials to record findings or work on a Continuum Activity if required.





K-2: Sports Challenge

If all of the above is true, congratulations on a successful Orientation and Planning.

If you are curious about what teachers can do on site, we've put together a little piece called Teacher Role.

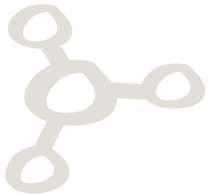


Finish the Investigation Back at School

Conclusions are drawn...

There are several ways you can complete the investigation. Some require less time than others. Here are some ideas:

- Student or group oral or written reports on investigation questions and answers
- Student or group illustrations of visit with answers to questions or mystery
- Do one of the Laboratory Activities
- Complete the Continuum Activity



Continuum Activities

Continuum Activities are designed to carry through the entire investigation. Some activities require less time than others.

Investigation Map

Description: Detectives will often map out related events, evidence and suspects during an investigation. This helps them get an overall picture. Students can map out their investigations with a concept map. The concept map will help you assess what students learn.

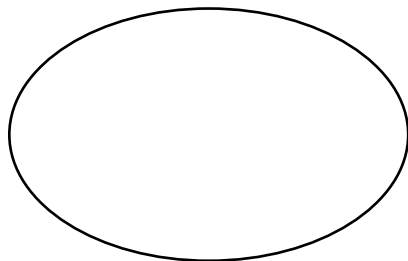
Time: (3)15-30 min. Sessions

Materials Needed:

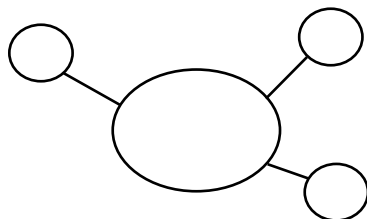
- Blank paper
- Pencils, crayons

Procedure:

1. Begin with a center circle and write in the name of the main topic. (Students who have difficulty with writing can have an adult assist or draw a representation of the main topic)



2. As students generate questions about the topic, they can add offshoot circles. They can also add circles for facts they know about prior to the visit to the New York Hall of Science.





K-2: Sports Challenge

- When students return from their investigation at the New York Hall of Science they add additional circles of information. Their final map should reflect everything they know about the topic. Teachers can easily assess what is learned based on how the map develops.



Investigation Journals

Description: Investigation journals provide a way for students to record their questions and findings throughout the investigation.

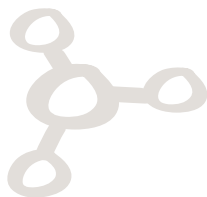
Time: (3) 15-30 min. Sessions

Materials Needed:

- Blank or lined paper
- Pencils or crayons
- On-Site Investigation Handout (print out from this web site and make copies)
- Zip-lock bags (for on-site handout only)
- Soft yarn or thick soft string (for on-site handout only)

Procedure:

1. Ask students if they have ever seen a detective take notes when trying to solve a mystery. Tell students that as “science detectives” they too will make a record of the mystery.
2. Have students begin their journal or report with questions that are generated when they Start the Investigation at School.
3. Students who do not have writing skills can make a large question mark and draw representations of their questions. If an experiment or demonstration is done, non-writing students can sketch what they observe.
4. Older students with writing skills can list their own and other students questions in their journal.
5. We strongly advise students not bring journals to the New York Hall of Science where they can get lost. We have provided an On-Site Investigation Handout that can be copied if students want to record observations or make sketches.
6. When students return from their investigation at the New York Hall of Science have them write answers to questions or draw what they observed.



Become an Explainer

Description: Student science detectives investigate one exhibit with the goal of being able to explain it when they return to the classroom. Students can choose a variety of methods to explain and make presentations.

Time: (1) 15 min. Session (right before going on Field Trip)

(2) 45 min. Sessions (for in-class presentations)

Materials Needed:

- Interesting object (used for student observation)

(optional suggestions)

- Variety of craft materials (string, paints, glue, tape, colored paper, scissors, etc)
- Variety of clean, household recyclables (meat trays, cardboard tubes, aluminum foil, plastic wrap)
- Any other odds and ends students can construct with
- Poster board or paper
- Markers, crayons





K-2: Sports Challenge

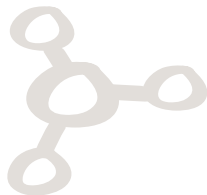
Procedure:

First Session



1. Tell students as “science detectives” they will be investigating exhibits at the New York Hall of Science and will choose one exhibit to explain to the class when they return. (students can work in groups or individually)
2. Help students prepare for careful observation of exhibits by showing them an interesting object. (make sure all students can see object)
3. Now ask students to verbally describe what they see. Encourage details.
4. After students have described the object in great detail, tell them they will need to use these same observation skills when they are investigating their chosen exhibit.
5. Go to the New York Hall of Science. (encourage observation and verbal descriptions)

Second Session



1. Upon return to class from the trip, tell students they will spend time preparing to explain one of the exhibits they saw.
2. Here are some suggestions for student presentations:
 - Verbal explanation (with or without picture)
 - Group or individual poster showing how an exhibit worked
 - Group or individual model using materials to represent exhibit (materials can be used to substitute and represent real materials from exhibit— ex. Clear plastic wrap simulates glass, cardboard tube becomes a rocket etc.)

Third Session (optional)

Use this time for students to make their class presentations if they made posters, drawings or models.



Laboratory Activities

Laboratory Activities are designed for the classroom and generally require simple materials. These activities can be done before or after a visit to the New York Hall of Science. To help students use higher-level thinking and generate questions, facilitate discussion with these types of questions:

- What do you notice here?
- Tell me about this.
- What do you see?
- Why do you suppose this happens?
- What can you conclude from the evidence?





K-2: Sports Challenge

Reflexes Demonstration

Description:

In this quick simple activity, two students demonstrate knee reflexes. The class learns about how reflexes help balance.

Time:

(1) 10 minute session

Materials Needed:

- a tall chair, desk or table

Procedure:

1. Ask for two student volunteers
2. Have one student sit on a chair, desk or table so that their feet do not touch the floor.
3. Instruct the other student to locate the reflex spot located just below the knee cap. The knee cap is a round bone called the patella. The spot is just below the bottom edge of the patella.
4. Once the right spot is located, have the other student give it a gentle tap with the side of their hand. Do not hit too hard. It should not hurt. They may have to tap a few times to find exactly the right spot. When they do, the leg should kick slightly.
5. Ask the sitting student if they made their leg kick on purpose. (the answer should be no)
6. Ask the students that if the kick wasn't on purpose, what made him/her kick? (student responses may touch on the real explanation so become familiar with the explanation below.
7. Tell students that the kick was triggered by a reflex. Reflexes are automatic reactions that help control and protect your body. They jerk your hand away from something sharp or hot to minimize the injury. The knee jerk reaction is one of the fastest reflexes, only taking about 50 milliseconds, which is much faster than you could do it on purpose.

Doctors use the knee jerk to test your nervous system, but what is the real reason we have this reflex? If the amount of weight on your leg suddenly increases, this reflex pushes back, helping you absorb the shock and keep your balance. It plays an important part in helping you walk and run, without falling on your face.

Adapted from Experiment of the Week #368, Robert Krampf's Science Education Company www.krampf.com

Tip Toe Balance Demonstration

Description:

Students observe a balancing demonstration and learn about the center of gravity needed to maintain balance.

Time:

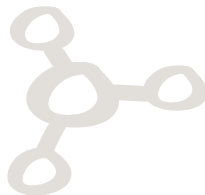
(1) 20 minute session

Materials Needed:

- a wall
- a student volunteer

Procedure:

1. Ask for a student volunteer.
2. Ask the student to stand on their tip toes. No problem right?





K-2: Sports Challenge

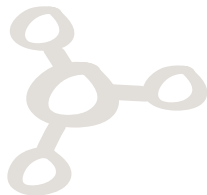


3. Now have the student get as close as possible to a wall and bring the tips of their toes to the bottom edge.
4. Tell the student to put their hands behind their back.
5. Now ask the student to stand on their tip toes. (they won't be able to do it)
6. Facilitate a discussion with the following questions:

(student responses may touch on the real explanation so become familiar with the explanation below.)

- Why is it so hard to stand on tip toe standing so close to a wall?
- Why would the wall keep you from doing it?
- What does the wall keep you from doing? (Leaning forward!)

7. Tell the students that when you stand on your tip toes, you lean forward to keep your balance. With the wall in the way, you can't lean forward and so you can't keep your balance while standing tip toe.



8. Now pose this question:

Why do you need to lean forward in order to keep your balance?

9. Tell students it has to do with your center of gravity. Think of the center of gravity as sort of a balancing point. As long as the center of gravity of an object is directly over its base, it will not fall over.

10. To demonstrate the center of gravity ask the student volunteer to stand with their feet together.

11. Tell students that if you drew a line straight down from your center of gravity, it would hit the floor under your feet.

12. Now ask the student volunteer to lean far enough to the side so that their center of gravity moves past their feet. (the student should lose balance)



13. Finally, tell students that when you stand on tip toe, you change your base. Instead of your entire foot forming the base, now only your toes are supporting you. Suddenly, your center of balance is not directly over your base (tip toes). You either have to lean forward to move your center of gravity back over your base, or you will fall backwards.

Adapted from Experiment of the Week #371, Robert Krampf's Science Education Company www.krampf.com

Balance Yourself

Description:

In this short, simple exercise, students use their bodies to learn about the center of gravity needed to maintain balance.

Time:

(1) 10 minute session

Materials Needed:

(per student)

- plenty of space
- a chair or something to hold on to at first



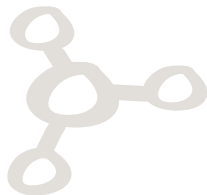
K-2: Sports Challenge

Procedure:



1. Give students the following instructions:
 - Stand beside a chair, so you will have something to steady yourself with.
 - Stand on your left foot.
 - Lift your right foot and place it on your left leg, above the knee.
 - Place your palms together and raise them up over your head.
 - Stand in this position and try to stay balanced.
 - Notice how your body reacts when you begin to lose your balance. You wiggle and jerk, trying to maintain your balance.

2. Explain to students that:



What you are really doing is trying to get your center of gravity back over your foot. Your center of gravity is not a fixed spot on your body. For objects that are fixed in their position, the center of gravity or balance point stays the same, but your body is not stationary, you move all the time and your body has to adjust. For objects that are solid, the center of gravity or balance point stays the same, but your body is not solid. When you move your arms, lean your head, etc., you are shifting the point where you balance. Once your body learns how to do this, balancing is much easier. The more you practice; the easier it gets.

Adapted from Experiment of the Week #395, Robert Krampf's Science Education Company www.krampf.com

Walk the "Y"

Description:

Students test their balance by walking a "Y" shape taped to the floor. Careful observation of how we balance is explored as well as sports that require balance.



Time:

(1) 20 minute session

Materials Needed:

- Masking tape or other nontransparent tape

Preparation:

Lay out three lines of tape on the floor in the shape of a very long and narrow "Y". It should be about 25 feet long and 2 feet wide at its widest end.

Procedure:

1. Tell students they are going to test their balance by walking the Y.
2. Line students up and have them place each foot at the two open ends of the "Y". Instruct the students to try to walk along the "Y" from the top, or open part, to the bottom, keeping their feet within or touching the lines.
3. After everyone has had a turn, select a student to demonstrate walking the Y.
4. Tell students to watch carefully and ask these questions:
 - How does your foot position change when walking the Y?
 - What other parts of your body do you use to stay balanced?





K-2: Sports Challenge

5. Choose another student to walk the Y only this time tell the student to:

- Walk the Y with their eyes closed
- Walk the Y with their arms to their sides

6. Now ask students to see how far they can lean over to the side with their feet together compared to with their feet apart.

7. To conclude, ask students what sports require players to stay balanced.

Adapted from Sports Challenge Teacher Guide © 2000 The Franklin Institute

Forward Mo!

Description:

Student teams experiment with jumping distances and learn the secret behind jumping farther. The term momentum is introduced.

Time:

(1) 45 minute session

Materials Needed:

- Large area for jumping teams (indoors or outdoors) (per student team)
- Tape or outside chalk (to make starting lines)
- Tape measure
- Paper strips for student names (teacher should prepare these in advance for non-writing students)

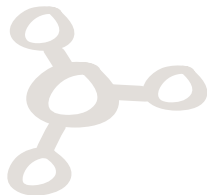
Procedure:

1. Tell students they are going to experiment with jumping distances and learn the secret behind jumping farther.
2. Divide the class into teams.
3. Distribute materials.
4. Instruct teams to write their names on the strip of paper.
5. Have teams tape a line on the floor or draw a line outside on the ground for the starting point.
6. For the first jump have students keep their arms kept at their sides.
7. Instruct other team members to measure the distance of the jump and place the students name strip at the tip of the jumper's toes.
8. Have other teammates take their turns.
9. Now have students jump with their arms behind them before they start, and then swing them forward as they leap out.
10. Instruct other team members to measure the distance of the jump and place the students name strip at the tip of the jumper's toes.
11. When all teams are done jumping, gather students for a short discussion.

Ask students: What is the secret to jumping farther? (using arms)

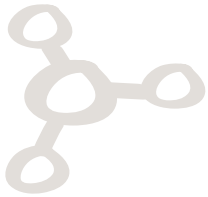
Tell students: When you swing your arms to jump you are creating something called momentum.

Adapted from Sports Challenge Teacher Guide © 2000 The Franklin Institute



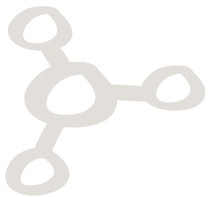


K-2: Sports Challenge



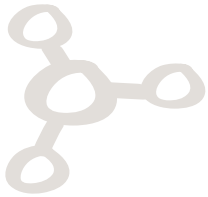


K-2: Sports Challenge



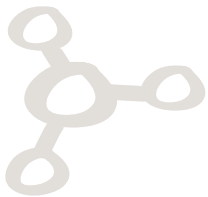


K-2: Sports Challenge



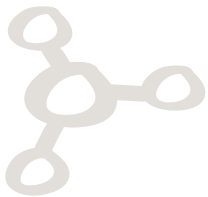


K-2: Sports Challenge



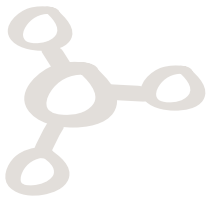


K-2: Sports Challenge



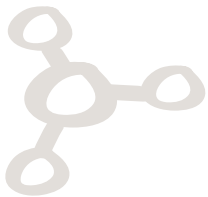


K-2: Sports Challenge



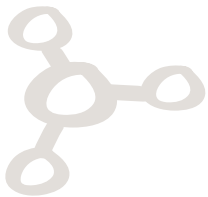


K-2: Sports Challenge





K-2: Sports Challenge





K-2: Sports Challenge

