TNTT Program AWARDS

2004 National Safety Council
Youth Activity Award of Merit
2007 NOVA National Hospital Association

The Physics of Bicycle and Helmet Safety

Bike Wheels to Steering Wheels Curriculum (BW-2-SW)

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Sponsored by
Legacy Emanuel Hospital's
"Trauma Nurses Talk Tough"
and
Oregon Department of Transportation
Traffic Safety Division

Curriculum Content

BW-2-SW Curriculum & Segment Description

The Bike Wheels to Steering Wheels (BW-2-SW) Curriculum was built by Portland Public School science curriculum specialists and is appropriate for 4th- 8th grade students to help Youth connect the dots between Newton's Laws of Motion and Traffic Safety.

The Bike Wheels to Steering Wheels curriculum meets the 1998-2007 OED State Standards for:
Eighth Grade:

- *Mathematics Statistics & Probability*
- *Physical Science*
- *Health Education Unintentional Injury Prevention*

Seventh Grade:

- *Mathematics Statistics and Probability*

BW-2-SW Curriculum is designed to be taught in earth science, personal safety, applied math classes or during after school science clubs to foster better understanding of the fundamental reasons for and importance of following traffic laws.

Through the BW-2-SW Curriculum Youth will develop understanding to help build safer bike, skateboard, snowboard, ski or ATV riders with the additional goal of increasing the number of safe drivers in the community, reduce healthcare costs and improve family stability.

BW-2-SW Curriculum in HANDS-ON! During the course of 6 lessons taught over 2-6 weeks + a TNTT Nurse's presentation, the student-built projects teach how friction, inertia, propulsion, motion and mass are affected by gravity.

NOTE: Call the TNTT Offices at 503-413-4960 or email tntt@lhs.org for local TNTT Network Member list and contact information.

BW-2-SW Curriculum 5 Lesson Segments, handout and instruction materials are ***FREE*** to download by interested school districts and teachers. A list of the project materials and where to purchase them is also available.

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ABOUT SAVING YOUR LIFE

BW-2-SW Curriculum Outline

1. Impact/Inertia

a. Pre Quiz
b. Lesson – “Busting Brains”
c. Demo- Hammering nails
d. Table Topper*- “Another Day in the Frontal Lobe”

2. Inertia Drop

a. Lesson – Introduction to Inertia
b. Demo- “Lazy Vase” & “Magic Thread”
c. Table Topper- “Nature’s Shock Absorber”

“Trauma Nurses Talk Tough” Presentation

3. Friction – two days

a. Lesson – Stop in the Name of Friction – two days
b. Table Topper- “Maglev Trains”

4. Inquiry

a. Lesson – Mass & Inertia Inquiry
b. Demo- Raw & Hard-boiled egg spin
c. Table Topper- “Fitch Barriers”

5. Wrap Up

a. Lesson- Wrap up Presentation
b. Table Topper- “NASA Brain Puzzle”
c. Post-quiz

*Table Toppers are for students to read at beginning of lesson, possibly during a snack break.

Physical Science Concepts Covered in the Lessons
Newton’s Laws

First Law- An object at rest remains at rest, and an object in motion remains in motion at constant speed and in straight line unless acted on by an unbalanced force.

Second Law- The acceleration of an object depends on the mass of the object and the amount of force applied.

Third Law of Motion- Whenever one object exerts a force on a second object, the second object exerts an equal and opposite force on the first.

Friction- Friction is a force that opposes motion.

BW-2-SW Curriculum Materials List

Lesson 1—

$ Soft tofu, ½ package/group
$ Small condiment cups with lids 3/group
# Meter sticks, 2/group
# Ruler, 1/group
Hammer
Flat-headed nails, 2/class
Piece of wood (2x4" 4-8" long)
$ Strips of soft foam
# Tape or rubber bands
# Post-Its
# Poster paper for graphs
# Chart pens
* Student handouts
$ Journals for students
# Safety goggles

Lesson 2—

$ Eggs (1 for each group)
# Masking tape 50cm
$ Straws 20
# String
# Paper
$ Craft sticks 10
$ Gallon size baggie
Tarp for dropping on
Ladder 10 feet
Beaker or vase
$ 1 kg mass- attachable to a string
$ Thread
# Ring stand

"Trauma Nurses Talk Tough" classroom presentation (Call 503-413-4960 to find a TNTT Nurse Network presenter in your local area. Be sure to schedule the TNTT nurse at least 1-2 months BEFORE the date you need her/him)

Lesson 3—(two days or extensive teacher prep)

For teacher demo
$ Miniature toy parachutist
$ Basic platform car
Rolling cart or any item on rollers
* Student Sheets
# Stack of books & coins
$ Sound tube, carpet, flex straws, balloons
# Weights, large washers, quarters,or any item that can add weight

Lesson 4—

$ Hot Wheels brand cars
$ Hot Wheels brand tracks
# Meter sticks
Graph paper
$ Dominos or blocks
$ Marbles
$ Hardboiled egg-labeled "A"
$ Raw egg-labeled "B"

Teacher discretion for items not marked
* Need to photocopy
$Teacher purchase
Should be available in building

Lesson 5—

* Brain puzzle sheets
* "NASA Goes to the Super Bowl"
* Bike Helmet & Safety information materials to copy and send home to Parents
Poster graphs from prior lessons

Resources for Curriculum Materials Kit	***Approximate Cost***
Approx. 2'x5' Carpet Remnant piece—Carpet dealership	$sometimes donated
Sweetheart 4oz Cups & Lids-Restaurant Supply Store	$5.00
Sound Hoses—stevespanglerscience.com (online)	$6.95
Superman Paratroopers—smilemakers.com (online)	$2.00
1 Kg Hooked Weight product #119-11 —thesciencefair.com (online)	$11.00
MyChron timers—learningforallages.com (online)	$28.00
Basic Car Platform Bulk Parts product #841417 —kelvin.com for 50 (includes axels, straws, wheels)	$107.00
Variety Store Approx. cost: Plastic drop cloth, 3/8" weather stripping foam strips, 3" flat head nails, hammer, safety goggles, sack of marbles, 1 box dominos, bag of balloons, Sharpie black pens, graph paper, Roll Cotton Twine/String, Packet Fine Sandpaper, thread, masking tape	$65.00
Hot Wheels track & cars	$20.00

Additional Experiment Materials & Costs: Extra Soft Tofu, Eggs, Copying

Acknowledgements:

Anna Scalera @ Bicycle Transportation Alliance
Bicycle Safety Institute
Holt Science and Technology—Physical Science
Minnesota Safety Council
NASA
Oregon Department of Transportation

***Special Thanks to*:**
Legacy Emanuel Hospital Trauma Nurses Talk Tough Program

Pre Quiz **Today's Date:________________**

Circle Gender: Male Female Birth date:__________________

1. When riding your bike you swerve sharply to the right to miss a squirrel and you crash into the curb. Which of the following best describes how your body moves?
   a. Your body flies backwards, because of your inertia.
   b. Your body flies forward head first over the handlebars, because of your inertia.
   c. Your body flies left, with your right leg just missing the handlebars, because of your inertia.
   d. Your body flies right, with you left let just missing the handlebars, because of your inertia.

2. On which surface is it easiest to stop while riding a bike?
   a. Dry gravel road
   b. Wet road
   c. Oil slick road
   d. Fresh powdered snow
   e. Dry pavement

3. Helmets work to protect your brain because:
   a. They are fashionably smart
   b. They stop impact
   c. They slow and reduce impact
   d. They push your brain the other way

4. Tony (35kg) and Maria (50kg) were racing their bikes down a hill and crashed into a hedge. Which shrubs were more severely damaged?
   a. The shrubs Tony hit
   b. The shrubs Maria hit
   c. The shrubs had equal damage
   d. No shrubs were damaged

5. Wearing a bike helmet is important while riding a bike because:
   a. Bike helmets help protect the brain from concussions and other brain injuries.
   b. Bike helmets help prevent damage or injury to the face.
   c. Unlike broken bones, brain injuries do not heal completely.
   d. All of the above

6. Bobby and Barry were racing down a path: they hit some gravel and crashed. Bobby lands on some soft grass and poor Barry onto the pathway. Why did Barry's helmet have to be replaced and not Bobby's?
   a. Because of the differences in their velocity.
   b. Because of the differences in their mass.
   c. Because of the differences in the surfaces they hit.
   d. All of the above

Quiz Key

1. **C**
2. **E**
3. **C**
4. **B**
5. **D**
6. **D**

Lesson 1: Busting Brains

Another day in the frontal lobe

Objective:

The purpose of a helmet is to absorb the shock of impact to the brain. Impact can be reduced by slowing the velocity of an object, changing the angle of the impact or by spreading the impact over a larger area.

Teacher Preparation:

1. Prepare and hang poster paper with graphs for data.
2. Cut tofu into 2cm x 2cm x 2cm sections for each group.
3. Copy pre tests

Pre Quiz:

Allow 5 minutes for students to complete the pre quiz. When students are done, collect the Pre quiz, checking to be sure the birth date and gender are completed.

Materials group:

½ Package ***soft*** tofu
3 Small condiment cups with lids
2 Meter sticks
Ruler
Paper Towels
Strips of soft foam
Tape or rubber bands
Procedure/data collection sheet
Journal for each student
Post it notes

Student Activity:

1. Distribute materials. Allow students to design 'protection' for dropping the tofu for the 2nd & 3rd demonstration
2. Review procedures with the students.
3. After each group has found their average or mean, have them mark the graphs with their labeled Post-its.
4. Distribute journals to students. Have them cut and paste their data into their journal. Give them some time
5. Use the following discussion prompts to promote reflection in their journals.

Post-lab discussion prompts:

• "Looking at the data graphs, what differences do you see between the plain tofu, the container tofu and the wrapped container tofu?" *Example: Cubes splatter, container tofu "shreds", wrapped in a sheet of paper towel is most intact.*
• "How is this model of a brain limited?" *Example: The tofu doesn't swell when bruised. Tofu doesn't bleed. Tofu does not have connective tissue or blood vessels to hold it together.*
• "So why does our brain not splatter when we take a moderate fall?" *Inside of the skull the brain is protected by a tough membrane called the dura matter.*
• "Can the brain still have damage even if we can't see it from the outside?"

Materials for class:

Poster graph paper
Safety goggles
Chart pens
Meter stick
2 flat-headed nails, roofing nails work well
Piece of wood
Hammer

Demonstration:

To show how increasing the area of an impact can reduce the severity of damage caused.
1. Have a student put on safety goggles.
2. Have the student hammer a nail into the piece of wood with three moderate hits.
3. After the nail has penetrated enough to stay in the wood, have the same student try to hammer the nail in with the head of the nail to the wood. They should observe that the nail does not enter the wood as easily or as far.
4. Ask the students why the nail head did not go in the wood as easily. If several students have proposed their ideas and they do not understand the importance of a larger area explain it to them.

5. Safely store the poster graphs for Lesson 5.

Tofu Drop

Carefully open the tofu package without damaging the block. Cut the block into 2 cm cubes. Drop the tofu square from 50 cm and measure across the diameter of the tofu in 3 places. Average the diameter and record. Repeat dropping the cubes from 80, 110, and 140 cm.

Data table: Tofu cube alone

Tofu drop distance	50 cm	80 cm	110 cm	140 cm
First measurement				
Second measurement				
Third measurement				
Average				

Repeat the drops with the cubes of tofu inside of the egg or condiment container. The tofu will not spatter because of the protection. Record the amount of damage that you see.
No damage: cube looks just like it did before dropping.
Some damage: the edges crumbled
Damaged: edges crumbled, pieces falling off
Major damage: cube is in pieces

Data table: Tofu in container

Tofu drop distance	50 cm	80 cm	110 cm	140 cm
First opinion				
Second opinion				
Third opinion				
Mode				

Data table: Tofu in container with form strips + wrap in single paper towel

Tofu drop distance	50 cm	80 cm	110 cm	140 cm
First opinion				
Second opinion				
Third opinion				
Mode				

Add Post-Its to the class graphs to show your data & opinion.

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Overhead Starter: Nature's Shock Absorber

Lesson 2: Introduction to Inertia

Objective: Following this lesson students will understand the concept of inertia. (*All objects are lazy and want to keep doing what they are already doing*.)

Materials:

Groups:
Eggs (1 for each group)
Masking tape 50cm
Thread
String 1m
Paper
Gallon size baggie

Teacher:
Ladder 10 feet
Tarp for dropping on
Beaker or vase
1 kg mass
Twine or String
Ring stand

Teacher's Introduction: Define inertia as—"Inertia is a word that scientists use to describe laziness. Objects will keep moving if they are moving and will stay still if not moving. Objects are lazy, it take a force to slow objects down or speed them up or make them change directions."

Demonstrations:

Lazy Vase Demonstration:
1. Place beaker or vase on top of paper and quickly remove paper.
2. Ask students what they see and why it happened. *The vase will not move, it is lazy. It wants to stay at rest.*

Magic thread demonstration:
1. Tie a string to the end of the mass and hang it from a ring stand.
2. Cut a piece of thread about 40 cm long and tie it around the bottom of the mass.
3. Gently pull the thread and observe what happens. (*The mass swings)*
4. Stop the mass from moving and hold the thread so there is a lot of slack between your fingers and the mass. Give the thread a quick, hard pull. (*The string breaks)*
5. How and why are the two examples different? Why did this happen? (*The mass was lazy- it wanted to stay at rest. The force on the string was spread out in the first demonstration so the impact was more gradual)*

Activity:

1. Question: Ask students "how does someone playing baseball run the bases after hitting a ball?" Have someone demonstrate. (Their path will be curved and will not be taking the bases at 90 degree angles.) "Why did you round the bases? Isn't the quickest path a straight line?" (The force needed to change direction was great. Their body is lazy. It wants to keep going in a straight line.)

2. Student task: "Your job today is to reduce the motion of the egg gradually so that it doesn't break." Suggested cushioning material: Bubble Wrap, Masking Tape, Cloth, Foam Rubber, etc.
3. Hand out materials and have students prepare the eggs
4. Drop the protected eggs with all participants observing from a height of 1 meter. Survivors drop from 2 meters and then from 3 meters.
5. Clean up (5 min)
6. Journal wrap-up discussion and questions:
• A fall from a height of .5-1 meter to concrete will destroy most brains.
• What conclusions can you draw from this fact?
• How high do most bicycle riders sit? (*1.5 meters off the ground)*

"Trauma Nurses Talk Tough" (TNTT) Presentation

NOTE:
The suggested optimum point for the TNTT classroom presentation is between Lesson's 2 & 3.

However, this presentation can be scheduled at any convenient point during the Bike Wheels to Steering Wheels curriculum segments.

Please call to schedule the TNTT Nurse at least 1-2 months prior to the date you wish her/him to visit your classroom.

Call 503-413-2340 for a list of TNTT Network Member nurses and contact information in your area.

Lesson 3- Stop In The Name Of Friction!

Lesson 1 of 2

Grade Level: 5-8
Subject(s): Physics, Mathematics
Prep Time: 10-30 minutes
Activity Duration: Two class periods
Materials Category: Common household

National Education Standards

Science: 2a, 3b   Mathematics: 3a, 3b, 3f

Objective: To observe that friction is more dependent on mass than surface area, and that different surfaces have different coefficients of friction.

Materials:

For teacher demonstration:

- Miniature toy parachutist
- Sound tube
- Stack of coins
- Stack of books
- Rolling cart or any item on rollers

For each team activity:

- Masking tape
- Old Science display boards
- Base for car
- Wheels and axles
- Scissors
- Meter Stick
- One stopwatch
- Set of slotted weights, large washers, quarters, or any item that can add weight
- Sandpaper
- Strip of carpet remnant
- Balloon and flex straw

Slippery When Wet!

Teacher Sheets

Pre-lesson Instructions

∗ This is a two-part lesson.
First day—students build cars and ramp; start collecting data.
Second day—students experiment with their cars, modify cars, and race them.
∗ Be sure all materials are either centrally located or already distributed to the teams.

Background

Friction is a force that acts in a direction opposite to the motion of a moving object. Friction will cause a moving object to slow down and finally stop. Every surface has little bumps and hollows on it. When two surfaces are rubbed together, the bumps and hollows catch and stick and resist the movement of the surfaces over each other. Thus, the amount of friction between two surfaces depends on how hard the surfaces are forced together and on the materials of which the surfaces are made. A heavy desk will force the surfaces together more than a light desk will. Likewise, if the floor is covered with a rough material such as carpeting, the desk will be harder to push.

There are three types of friction. Sliding friction is when solid objects slide over each other, and more force is needed to start an object sliding than to keep it sliding. Rolling friction is produced by objects such as wheels or ball bearings and is less than sliding friction. Sliding friction and rolling friction describe friction between two solid surfaces. However, there is friction that exists when objects move across or through a fluid. This force exerted by a fluid is called fluid friction. All liquids and gases are fluids. Water, oil, and air are examples of fluids.

Friction is useful. In fact, without friction you would not be able to walk, cars would not be able to stop, we could not write, unscrew bottle tops, etc. NASA's research on friction and their application to hazardous runways have benefited mankind. Lives have been saved in many hazardous locations by reducing hydroplaning, which is considered the primary cause of uncontrolled skidding during wet weather conditions.

Guidelines

Day one:
1. Read the Maglev trains article and discuss what friction is and why it is important to automobile and bicycle safety using information above and any other sources available.
2. Throw a toy parachutist in the air. Ask students how this relates to friction. Spin a sound tube, and ask the same question. (Both items are examples of fluid friction.) Next, push a stack of books across the floor, a stack of coins across a desk, and ask how they relate to friction. (Both are examples of sliding friction) Finally, use an item that rolls, and ask the same question. Explain that this is an example of rolling friction, which is what they will be testing in this experiment.

3. Talk about the experiment with students, have them make predictions on which track will be fastest, and whether added mass will increase or decrease the speed of the car.
4. Distribute the materials and worksheets to each team.
5. Remind students to follow directions. If time allows, they can name and decorate their cars.
6. Students should start collecting data on day one.

Day Two:

1. Have students finish collecting data with and without added mass.
2. Encourage group discussion of the results; do the results match their predictions?
3. If one or two groups are way ahead of other groups, have them make predictions of how even more mass would change the results and have them test their predictions.
4. Have a short class discussion on friction. Have each group share results from their experiment. How does this experiment relate to helmet safety? Why are helmets smooth? How does your mass affect your crash result? When riding your bike, what surfaces are going to be easier to stop on? (gravel vs. asphalt, grass vs. concrete) Note: Mass increases friction, but it also increases inertia which will be covered in the next lesson. A kid with greater mass will have more friction (stopping power) but will also have more inertia to overcome.
5. Allow groups to work on cars, trying to reduce friction. Encourage groups to think about what they have learned about reducing friction; you may want to have coping saws available for groups to reduce mass. If you don't have saws available let students use sandpaper. You may also want to have some sort of lubricant available. Then have groups add an energy source (i.e. a balloon and a straw). Have students' race cars, and have a prize for the winning group.

Friction! Friend and Foe

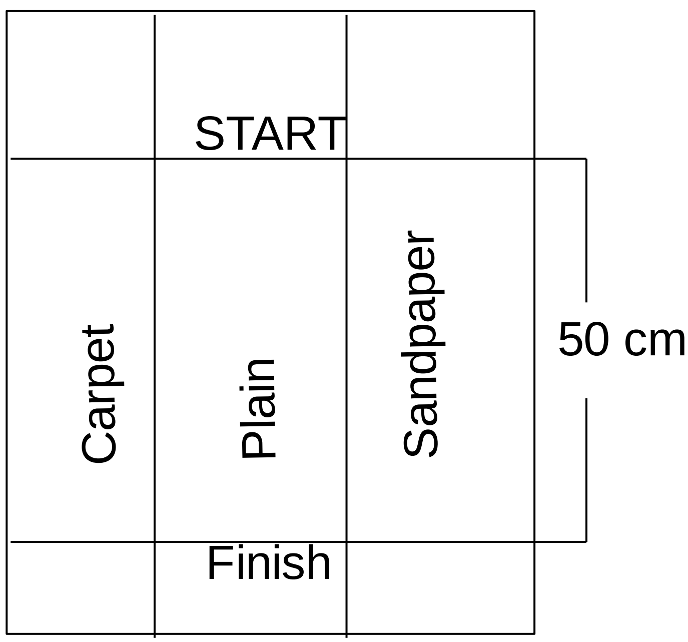
Building your car:

1. On your chassis draw parallel lines that are approximately 3 cm from each end.

2. Cut your stir straw so you have two pieces the same width as your car. Glue or tape the straw pieces securely onto the lines.
3. Put one wheel on each axle, slide the axles through the straws, and push on the remaining wheels.

Building your ramp:

1. You need to create a ramp with three different surfaces that has a starting line and a finish line. Build your ramp based on the drawing below. Leave display board folded. Carpet and sandpaper should run clear from the top to the bottom of the display board.



2. Setting the angle of the ramp: place car on the start line and lift the start end of the display board until the car runs down. Repeat with each of the three surfaces. Place books, or whatever works, under the ramp at an angle greater than the angle that works for every surface.
3. Collect data with car – fill out worksheet. Add mass to car – repeat experiment.
4. Compare results. How does the surface affect the speed of the car? How does the mass affect the speed of the car? What does this tell you about friction?

Car without added mass

Plain

Trial	Distance	Time	Speed (Speed = Distance/ Time)
1			
2			
3			

Average (Mean) Speed = _________

Carpet

Trial	Distance	Time	Speed (Speed = Distance/ Time)
1			
2			
3			

Average (Mean) Speed = _________

Sandpaper

Trial	Distance	Time	Speed (Speed = Distance/ Time)
1			
2			
3			

Average (Mean) Speed = _________

Car with added mass

Plain

Trial	Distance	Time	Speed (Speed = Distance/ Time)
1			
2			
3			

Average (Mean) Speed = _________

Carpet

Trial	Distance	Time	Speed (Speed = Distance/ Time)
1			
2			
3			

Average (Mean) Speed = _________

Sandpaper

Trial	Distance	Time	Speed (Speed = Distance/ Time)
1			
2			
3			

Average (Mean) Speed = _________

Lesson 4: Mass and Inertia Inquiry

Table Topper:
Fitch Barriers

Objective:

By the end of this lesson students will understand that more mass will mean having more inertia. An object that is moving will want to keep moving more because it is lazy. It will also apply more force than a lighter object.

Materials:

Hot Wheels brand cars
Hot Wheels brand tracks
Meter sticks
Graph paper
Dominos or blocks
Marbles
Hardboiled egg-labeled “A”
Raw egg-labeled “B”
Inquiry prompt overhead
“In the Eyes of a Physicist” overheads

Demonstration:

1. Spin a hardboiled egg (A) and stop it.
2. Spin a raw egg (B) and stop it. Students will observe that the raw egg will start spinning again.
3. Why? (*The yolk in the egg will continue to move because of its inertia. It is lazy*)

Teacher’s Introduction:

1. Review with students what they know about inertia so far.
2. Using the overhead, have students think about, “If we have more mass do we have more inertia?”
3. “How can we test this statement?”

Activity:

1. “In teams of 3 or 4, use hot wheels to set up an experiment to prove or disprove this statement.”
2. Things to consider—
a. “How will your variables be controlled?”
b. “What materials do you need to use?”
c. “How will you measure your data?”
3. Give students ample time to explore and set up these questions.
4. Approve their design before allowing them to pick up materials.

Follow up:

1. Ask the teams, “So does more mass mean we have more inertia? How did you design your experiment to test it? Using your data support your conclusion.”

2. “Newton’s 2nd Law states that force is equal to mass and acceleration. What will happen when the mass is increased and the acceleration remains the same? For example you are riding a bike then your buddy wants a ride how does this extra person’s mass affect your force on the pedals?” *(The force increases)*

3.“How will wearing a backpack affect your stopping distance when riding your bike?” (More mass *increases the stopping distance.)*

4. Show students the “In the eyes of a physicist” overhead series. Have them respond in their journals.

Table topper: Fitch Barriers

Lesson 5: No-Brainer Puzzle Activity

Objective:

Students learn the main brain impact points in a crash and the functional implications. Using data from previous experiments, each team of students will present data, relating their results to bike helmet safety.

Materials:

Brain puzzle sheets
Overhead of puzzle answer key
Copies of "NASA Goes to the Super Bowl", if desired
Overhead of helmet photo
Overhead of "Brain Bruising"
Poster graphs from prior lessons
Table Toppers for evening
Field trip permission slips, get parents to sign for Lesson 6

Teacher Preparation:

Copy brain puzzle pieces & "NASA Goes to the Super Bowl"
Retrieve posters from prior sessions

Student Activity:

1. Students piece together the brain puzzle from NASA.
2. Show students the overhead of the answer key.
3. Discuss the "Brain Bruising" overhead. "From the physics you have learned, why are there two areas that are damaged when there is an impact to the brain?"
4. Read to the class the first 8 paragraphs of NASA Goes to the Super bowl. You may wish to have student copies so they may read with you. Show the overheads of the helmet.
5. Discuss the features of the helmet that protect the brain from injury. They should include- straps, hard shell padding.
6. Divide the groups into teams to present the data from the prior experiments.
7. Hand out reserved graphs to groups.
8. Tell the groups, "You have 20 minutes to plan a presentation to the class showing how the data from the experiment you have been assigned relates to bike helmet safety. Remember to use the science terms we have discussed in the past sessions."
9. Students present their data.
10. Copy Bike Helmet parent information materials along with the parent signature forms
11. Consider giving extra credit to students who return signed forms

Post Quiz:

Allow 5 minutes for students to complete the post quiz. When students are done, collect the Post quiz, checking to be sure the birth date and gender are completed.

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Post Quiz **Today's Date:_____________**

Circle Gender: Male or Female Birth date:________________

1. When riding your bike you swerve sharply to the right to miss a squirrel and you crash into the curb. Which of the following best describes how your body moves?
a. Your body flies backwards, because of your inertia.
b. Your body flies forward head first over the handlebars, because of your inertia.
c. Your body flies left, with your right leg just missing the handlebars, because of your inertia.
d. Your body flies right, with your left leg just missing the handlebars, because of your inertia.

2. On which surface is it easiest to stop while riding a bike?
a. Dry gravel road
b. Wet road
c. Oil slick road
d. Fresh powdered snow
e. Dry pavement

3. Helmets work to protect your brain because
a. They are fashionably smart
b. They stop impact
c. They slow and reduce impact
d. They push your brain the other way

4. Tony (35kg) and Maria (50kg) were racing their bikes down a hill and crashed into a hedge. Which shrubs were more severely damaged?
a. The shrubs Tony hit
b. The shrubs Maria hit
c. The shrubs had equal damage
d. No shrubs were damaged

5. Wearing a bike helmet is important while riding a bike because
a. Bike helmets help protect the brain from concussions and other brain injuries.
b. Bike helmets help prevent damage or injury to the face.
c. Unlike broken bones, brain injuries do not heal completely.
d. All of the above.

6. Bobby and Barry were racing down a path; they hit some gravel and crashed. Bobby lands on some soft grass and poor Barry onto the pathway. Why did Barry's helmet have to be replaced and not Bobby's?
a. Because of the differences in their velocity.
b. Because of the differences in their mass.
c. Because of the differences in the surfaces they hit.
d. All of the above could be causes.

Quiz Key

1. C
2. E
3. C
4. B
5. D
6. D

Parent Signature Form

My son/daughter ____________________________brought home the Bike Helmet and Safety information materials on:___________.

I plan to read the Bike Helmet and other Safety information and discuss it with my student. Yes No

Please sign and return this form to your student's teacher.

Signed:____

Address:____

City:_______________________________________Zip Code:_____________

Project Evaluation and Enhancement

Observations:

- Pre curriculum, observe helmet use among youth who will participate in the project
- Post curriculum, observe helmet use among youth who have participated in the project

Reinforcement Education

- Pre/Post curriculum student quiz
- Bike Safety handouts sent home to parents
- Parent Signature form returned to teacher indicating whether the parent read the bike safety handout information
- Student Preliminary Survey conducted in-class after the curriculum is completed
- Families provided the Bike Wheels to Steering Wheels: A Parent's Guide to Strengthen Traffic Safety in Families booklet (a copy is included with the curriculum)
- Family Follow-up Survey conducted 2-3 months after curriculum is completed
- Partner with a local bicycling organization to organize a supervised student bike ride

NOTE: To help increase survey return, consider offering incentives to both students and parents.

FYI: The Surveys are formatted to collect mailing information to facilitate incentives. If you do not plan to use incentives, simply design a survey without information collection.

Survey Participation Incentives:

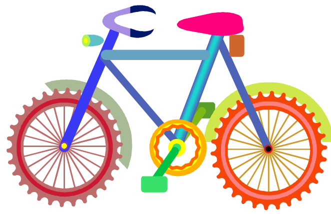
- Bike lights
- Bike helmet raffle drawing
- Coupon redeemable for a free or at a reduced cost bike helmet to be claimed at a local hospital-sponsored bike helmet fitting fair or other sponsored partner event (Design the coupon indicating date, event, limit & where it is redeemable)

Funding & Partners:

Consider applying project funds or in-kind support and partnership through:

- State Department of Transportation grant support
- City Department of Transportation grant support
- Hospital or Fire Department Health Fair
- Rotary Chapter or other philanthropic organization support

Bike Wheels to Steering Wheels Project
Preliminary Student Survey




It is just a short while before YOU continue driving a bike and BEGIN driving a car!

What have you learned?

√Answer the questions below √Fill out the contact information √Return this form to your teacher

1. Did the safety curriculum you just completed in your class help you understand *HOW* Newton's Laws of Motion connect to traffic safety? ° Yes ° No
2. Do you ever ride on a bike, scooter, skateboard, snowboard, skis or ATV? ° Yes ° No
3. Do you have a helmet to wear when riding on a bike, scooter, skateboard, snowboard, skis or ATV? ° Yes ° No
4. If you answered 'yes' to question #3, do you ***properly*** wear your helmet ***each time*** you ride on: (circle all that apply)

   Bike Scooter Skateboard Snowboard Skis ATV
5. Do you understand it is safer for you to sit in the backseat of a car properly safety belted until reaching age 15 because some internal organs in your body are not yet fully developed and because the back seat is the safest place to sit in a car? ° Yes ° No

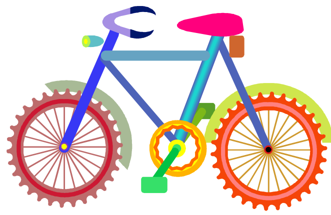
Thank YOU for your participation!!!

Return the survey to your teacher today!

Your Name:	
Address:	
City:	**Zip Code:**

Bike Wheels to Steering Wheels Project

Family Follow-up Survey




Before you know it, your student will be driving a Car!

Are you prepared?

√Answer the questions below √Fill out the contact information √Return this form to your teacher

1. Did your student share what he/she learned in class about *HOW* Newton's Laws of Motion connect to traffic safety? ° Yes ° No
2. Have you read the Bike Wheels to Steering Wheels Parent Guide booklet included with this survey? ° Yes ° No
3. Will you and your student sign the Traffic Safety Agreements found in the booklet? ° Yes ° No
4. Is it your family policy to require your children to wear a helmet when riding: (Circle all that apply) Bike Scooter Skateboard Snowboard Skis ATV
5. Do you require your children to sit in the backseat of a car properly safety belted until reaching age 15 because some internal organs are at risk from damage by airbags when deploying and because the back seat is the safest place to sit in a car? ° Yes ° No

Thank YOU for your participation!!!

Your Name:
Address:
City:
Zip Code: