

Simple Machines: Balls and Ramps Unit

What is a simple machine?

How are balls similar and different and what can they do?

What is an inclined plane and what is it used for?

Subject Area: Science

Grade: Kindergarten

Length: Approximately two weeks, 30-45 minutes/ lesson

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Rationale

W- The purpose of this unit is to help students to understand basic properties of balls and ramps and how differences exist among balls of various shapes and sizes, in addition to how they interact with ramps in different contexts (i.e. rolling a ball down a ramp positioned at a certain angle to see how far it will go). It is also meant to aid development of investigative skills in students through guided scientific inquiry which include student's abilities to ask scientifically oriented questions and how they might go about answering these questions.

H- First I will begin the unit by reading the students the book Pigs on the Ball: Fun with Math and Sports by Amy Axelrod to introduce/ get the students thinking about various types of balls and how they may be similar or different from one another in terms of appearance, what they can do, etc. I will also ask students to bring in a circular object (which can be a ball or something else) from home to share with the class during circle time on the day of one of the lessons to help keep them engaged after they have had some time to explore using different types of balls throughout the week. I will be sure to have a collection of circular items from which students who forget their object from home can borrow from the classroom to share.

E- Students will be engaged through being read various stories that capture their attention and interest in balls and their similarities and differences, through small and large group scientific inquiry, and through being encouraged to make connections between balls, their properties, and how these connect to their lives.

R- Throughout the unit students will have the opportunity to rethink or revise their ideas through group discussion, experimentation, and simple research that I will introduce to the class. Students will have opportunities to ask questions and take ownership of their learning during an open inquiry time that will take place towards the latter part of the unit (still being guided to a certain extent).

E- Students will self-evaluate their learning through asking questions, testing those questions, and through the opportunity to compare their results to their classmates. One way this will be done is through making two class bar graphs after a small group experiment aimed at testing the bounciness of various balls based on how many times they bounce when dropped from a specified height (one foot) from the ground. One class graph will document which balls small groups (two students/ group) found bounced the most and which balls they found bounced the least number of times when dropped.

T- The various needs, interests, and learning styles of the students will be addressed throughout this unit. One way this will be done is by asking students to bring in a circular object from home that they use in every day life (this can range from something like a tennis ball for a sport to an orange that they might eat for breakfast). Students will be given time to share their object, how they use it in their everyday lives, and something unique about it. Also for small group experiments groups will be organized in such a way that learners who may struggle more with an activity will be placed with others who are more comfortable with it. Also the material will be explored in a variety of forms to help cover the various learning styles the inevitably exist among the students. Some of these forms include discussion, reading and looking at pictures, hands on activities, creating graphs, and more.

O- This unit is organized with the intention of awakening children's curiosity and interest towards learning about balls, their different properties, and eventually how they can interact with ramps to make a simple machine. A "hook" will first be used through the reading of the book Pigs on the Ball: Fun with Math and Sports followed by a pre-assessment of students prior knowledge as

well as questions about balls through a teacher guided class discussion during completion of a KWL chart. This will lead to lessons where various experiments are performed both in a small and large group context that will help children to assess some properties of balls and how and why they might vary across the range of balls. Students will also be encouraged to ask their own questions throughout the unit and students will be guided to refine their questions leading to investigation of these questions either as a class or in small groups during a time for open inquiry. Follow-up assessments will include making word web as a class to brainstorm and list the properties of balls under categories such as feel, color, kind, shape, made of, size, and move to help students reflect of the variety of properties balls have after being given time to explore and observe these on their own while working with a variety of balls in small groups. Students will also complete some worksheets while doing experiments in small groups to help them keep track of what they observe about the different properties of balls. One will help them to record the bounciness of four different types of balls and the other will help them to record properties such as size, weight, bounciness, and ability to roll when two different balls are compared. The concluding assessments will include having students illustrate real life ramps they have seen and share these with the class in addition to students sharing what they discovered when they constructed their own ramp from a variety of choices in the classroom. Before constructing these ramps students will be asked to create a plan for their ramp on a piece of paper consisting of a drawing of what they are going to make the ramp out of in the classroom and a question they have about what they want to test when they do the experiment (ball speed, ability to roll, etc.)

Basic Information Summary

Key concepts

Simple Machine- Def. A tool that uses force to make work easier

Matter- Def. Anything that has mass (the amount of stuff in an object) and takes up space (everything around us)

Gravity- Def. An attractive force between matter

Properties of balls

-Balls have different physical properties which include size, shape, weight, surface texture, and composition

-Physical properties of balls influence the way that balls move on flat surfaces

-Balls vary in the degree of easiness in which they start or stop moving, in addition to the force needed for them to knock over a certain object when they are rolling, as well as how they bounce, and how they roll (depending on their roundness)

Bounciness- Def. The degree to which something rebounds from a surface

-as a ball hits the ground, both the ball's surface and floor's surface changes, more or less depending on the material of each; this change uses up some of the ball's energy

-Properties of balls affect how those balls behave on ramps

-steepness of a ramp affects the distance a ball will roll and what objects in its path it will be able to knock over

-the size and the weight of a ball does not affect how quickly a ball is able to reach the bottom of a ramp or how far that ball rolls

-the weight of a ball does affect what objects it can knock over after it goes rolling down a ramp

Properties of inclined planes

Inclined planes (ramps or slopes)- simple machines that make it easier to move something heavy (versus lifting it purely vertically) with a surface that is slanted or tilted

-an object on an incline plane is pushed uphill and pulled downhill by the force of gravity

Ramp- a simple machine with a slanted surface that helps people and things move between higher and lower places

-allow people to do less work to move things between higher and lower places

-requires a lot of force (another word for energy) to lift and move something that is heavy, but it is much easier to push it up a ramp

-the steeper the ramp the harder it is to push things up it

-still require the same amount of work to move objects as it takes to move objects from a lower to a higher place without a ramp, but requires less force over a greater distance to move the object; creates the choice of doing easier work over a longer period of time or harder work over a shorter period of time

-in Old Kingdom Egypt (around approximately 2500 B.C.) people were using ramps to move heavy stones in order to build the pyramids

Examples of inclined planes:

- Ramp
- Slanted road
- Slide
- Path up a hill
- Skateboard park
- Stairs
- Roller coaster
- Ladder
- Steps

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<http://learningideasgradesk-8.blogspot.com/2011/05/what-is-inclined-plane.html>

<http://scienceforkids.kidipede.com/physics/machines/inclinedplane.htm>

<http://www.uen.org/Lessonplan/preview.cgi?LPid=28238>

Parr, D. Contributors Farndon, J., Graham, I., Oxlade, C., and Taylor, B.(1999). Science Encyclopedia. Mile Kelly Publishing Ltd.

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Stage 1: Desired Results

Topic: Simple Machines: Balls and Ramps

Established Goals/ Standards:

CC.1.2.K.C: With prompting and support, make a connection between two individual, events, ideas, or pieces of information in a text.

CC.1.2.K.G: Answers questions to describe the relationship between illustrations and the text in which they appear.

CC.1.2.K.J: Use words and phrases acquired through conversations, reading, and being read to, and responding to texts.

CC.1.2.K.K: Determine or clarify the meaning of unknown or multiple meaning words and phrases based upon grade level reading and content.

CC.1.2.K.L: Actively engage in group reading activities with purpose and understanding.

CC.1.4.K.A: Use a combination of drawing, dictating, and writing to compose informative/explanatory texts.

CC.1.4.K.B: Use a combination of drawing, dictating, and writing to focus on one specific topic.

CC.1.4.K.C: With prompting and support, generate ideas and details to convey information that relates to the chosen topic.

CC.1.4.K.T: With guidance and support from adults and peers, respond to questions and suggestions from peers, and add details to strengthen writing as needed.

CC.1.4.K.V: Participate in individual or shared research projects on a topic of interest. .

CC.1.4.K.W: With guidance and support, recall information from experiences or gather information from provided sources to answer a question.

CC.1.5.K.A: Participate in collaborative conversations with peers and adults in small and larger groups.

CC.1.5.K.B: Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

CC.1.5.K.C: Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

CC.1.5.K.D: Share stories, familiar experiences, and interests speaking clearly enough to be understood by all audiences using appropriate volume.

CC.1.5.K.E: Speak audibly and express thoughts, feelings, and ideas clearly.

CC.1.5.K.G: Demonstrate command of the conventions of standard English when speaking based on kindergarten level and content.

3.1.K.A9:

- Distinguish between scientific fact and opinion.
- Ask questions about objects, organisms, and events.
- Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known.
- Plan and conduct a simple investigation and understand that different questions require different kinds of investigations.
- Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their senses to gather information.
- Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific

knowledge.

-Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be reproduced, and review and ask questions about the work of other scientists.

3.2.K.A1: Identify and classify objects by observable properties of matter. Compare different kinds of materials and discuss their uses.

Enduring Understandings:

- An inclined plane is a simple machine and it makes work easier and faster by helping move things from somewhere lower to higher or higher or lower with less effort
- Balls have things in common with one another that make them balls (they are all around, they roll) but also have differences and so are used for different purposes

Essential Questions:

What is a simple machine and how do simple machines make work easier?

What are balls and what can they do?

Students Will Know:

- Simple Machines make help to make work faster and easier
- The basic properties of balls including its texture, how it moves, size, shape, appearance, what it's used for, and what it's made of
- Similarities exist between balls: all are circular, roll, etc.
- Some balls share certain properties and some balls differ in their properties which influences what they can do and be used for
- How different forces (i.e. the force of gravity on a ball placed on an inclined plane) and balls with different properties interact
- Relationship between the physical properties of balls and how they behave on inclined planes (ramps)
- Relationship between the steepness of an inclined plane (ramp) and the motion of balls
- Inclined Planes help us to move heavy things from lower to higher places and from higher to lower places

Students Will Be Able To:

- Conduct a simple experiment to answer a question
- Formulate questions they have about something they have seen or observed
- Share the findings from their experiments with the group
- Look at and analyze data organized and displayed in a bar graph to determine important and relevant information
- Brainstorm ideas to explain something they have seen or observed and orally express these ideas to a group
- Work together with other students to answer a question or discuss an idea

Stage 2: Assessment

I. Pre-Assessment

- Initial observation of student contributions during discussions, especially of what students already know when filling out the "Know" section of the KWL chart
- Observe what students share when they bring in their circular object from home and what they say in their explanation of their object while sharing

II. Formative Assessment

- Bell ringer worksheets (should serve as a review/ assessment to see what students have retained or already know)
- Student contributions when listing different properties of balls on the "word web" graphic organizer after initially allowing students to explore and play with a variety of balls during one of the earlier lessons
- Student findings and contributions to the "most bouncy" and "least bouncy" class graphs that comprise data from all the pairs who tested four different balls for the number of times they bounced
- Drawing of an inclined plane students have seen at school, home, or somewhere else in the community
- Discussion, student observations, and question asking throughout the lessons

III. Summative Assessment

- "Comparing Bounciness II" science notebook page and resulting discussions
- "Comparing Balls" science notebook page and resulting discussions
- “Learned” section of KWL chart

IV. Adaptations

- To enforce key concepts, choose bell ringer worksheets accordingly, especially for learners who need extra practice exploring/ review a concept or concepts
- To extend student thinking, keep a list of questions students ask that promote further exploration of the topic/ concept being studied. Allow guided opportunities for additional exploration of some of these questions, especially for learners who seem to be grasping the unit quickly
- Place students in small groups accordingly, especially when making groups for a guided exploration, according to their strengths and needs to enhance learning for all students
- Inclusion of a variety of ways throughout the unit that students can express their understanding of an idea or concept (i.e. verbally, through drawing, etc.) including graphic organizers, KWL chart, and worksheets to collect data using writing and drawing

Stage 3: Learning Plan

I. Materials

- Pigs on the Ball: Fun with Math and Sports by Amy Axelrod
- Chart paper
- Variety of balls from balls and ramps kit
- The Berenstain Bears Ride the Thunderbolt by Stan & Jan Berenstain
- Borax
- Corn starch
- Elmer's glue-all
- Warm water
- Food coloring
- Measuring spoons
- Bowls
- Cardboard ramp
- Ramp plastic base
- Handheld stop clock
- Meter stick
- Large plastic tub
- Sticky notes
- Worksheets "Science Notebook Page: Comparing Bounciness II" and "Science Notebook Page: Comparing Balls" (20 each) from *Teacher Guide. Insights. An Elementary Hands-On Inquiry Science Curriculum (Balls & Ramps- Grades K-1)*. 2nd Edition. 2003 Edition (Spiral-Bound).
- Show and Tell note home to student's families to remind students to try to find a circular object to bring to school for circle time (19)
- Simple Science: Slopes by Caroline Rush
- <http://www.youtube.com/watch?v=tvLDkNdDrqY>

II. Procedures

Lesson 1: Introducing balls

Goal: To engage students in thinking about a variety of balls and their properties and uses and evoke questions students have about balls.

Procedures:

1. Begin by reading the students Pigs on the Ball: Fun with Math and Sport by Amy Axelrod. Before starting the story, ask students to make observations about different balls they hear about as the story is read/ see in the illustrations and have students raise their hands to share throughout the story. Read the story aloud.
2. At the end of the read-aloud, review the ideas of "similar" and "different". Make two categories on the board, one for similarities and one for differences, under the overall heading of "balls". Asks students to raise their hands and share their observations about balls mentioned in the story.
"How were the balls we read about alike? How were they different?"
Record students answers on the board (this activity should be brief).
3. Bring out a KWL chart drawn on a large piece of paper. Tell the students we will be learning

about balls, what they can all do (their properties), and some similarities and differences between balls pertaining to what they can do. Ask students to think about what they already know about different balls they have seen/ used in their everyday lives.

Guiding questions if students are having difficulty coming up with ideas and questions:

“What balls do you use for different sports? Are they all the same shape? Do they all move the same way? What are they used for?”

“What other things have you seen at home, school, or other places you have been that are round like balls?”

Allow 10-15 seconds of wait time for students to come up with an answer. If students have trouble thinking about this, scaffold learning by having them think about balls used in sports, at home (cotton balls, foods in that are in the shape of a ball, etc.).

Record student answers about what they already know about balls and their properties under the "Know" section of the KWL chart.

4. Then have students think about things they want to know about balls. Briefly put students in pairs and ask them to share with a partner one thing they would like to find out about balls (i.e. do they all roll at the same speed? what types of balls bounce the highest?) Then bring the class back together and have students share questions, recording these under the "Want to Know" section of the KWL chart.

5. Tell students that they will be choosing a few questions from this section to investigate as a class as we learn about balls this week to close the lesson.

Materials:

-Pigs on the Ball: Fun with Math and Sports by Amy Axelrod

-White board

-Chart paper with outline for a KWL chart

Lesson 2: Exploring balls and their properties

Goal: For students to make observations about balls and their properties and to use a graphic organizers to visually display these observations in an organized way

Procedures:

1. Choose some questions ahead of time from the "want to know" section of the KWL chart that would be possible for students to explore more through guided inquiry (combine, change wording, simplify as needed). Have students vote on which questions they would like to explore using tally marks as a way to connect science to the math concept of using tally marks to keep track of votes in an organized and clear way; tell students they can vote for more than one question but must vote at least once. Tell students they will be exploring some of these questions later in the week.

2. Split students into pairs and give each pair a bag with a few different balls hidden inside (2-3). Ask them to each take turns and use their senses to describe to each other differences in the way the balls feel, bounce, roll, etc. After a few minutes allow students to take the balls out of the their paper bags and continue to interact with them seeing what they look like, feel like, what they can and can't do, etc. Then come back together as a class have each group share two things they discovered. Encourage students to share things they discovered that are different from their classmates but if the same thing is mentioned multiple times emphasize this consistent observation/ finding to help students create generalizations about all balls and their similarities. Make a web map to note student observations- try to keep labels short and simple.

3. Allow students time to then play with the balls outside of the bag (in sight) and add some other

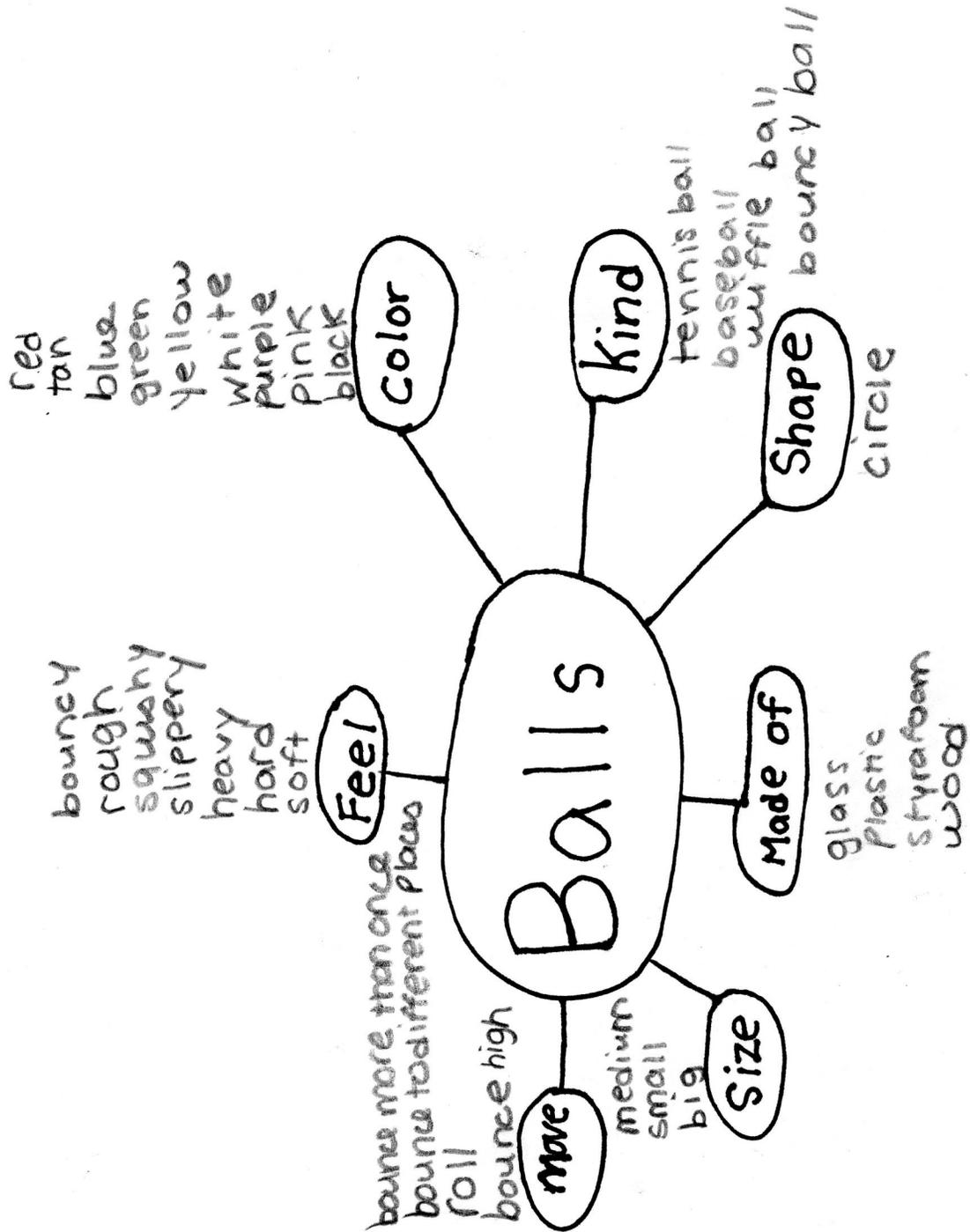
balls to the mix (keep students in pairs while doing this). Give guidelines before allowing this free exploration- i.e. students must not throw the balls, must keep the balls within a certain space, etc. After students have had some time to explore have them share anything else they would like to add that they discovered about balls.

Add anything students share to the web map as necessary. Review the web map and all students shared in terms of observations about balls.

Materials:

- KWL chart
- Paper bags
- Variety of small balls
- Web map paper outline
- White board

Ball Observations Web Map:



Lesson 3: Comparing Bounciness Experiment

Goal: For students to test and make observations about how different types of balls bounce including what kind bounces the most and what kind bounces the least.

For students to gain experience conducting a guided experiment with a partner, collecting data, and using and analyzing this data as a group to answer a question.

Procedures:

1. Review the web map about ball observations the students made the day before about different properties that balls can have.
2. Discuss with the students the idea of the property of "bounciness" and what they know about this property.

Ask questions such as:

"What things do you know that bounce?"

"What does bounce mean?"

As students contribute answers, make a list of student responses on the white board. Then read the list aloud to review all of the student's answers.

3. Lead a guided exploration exploring a specific property, the "bounciness" of four different balls; tell students they will be working out in the hallway as they do this experiment so they have more room and so there will be less of a chance that the balls will become lost as they bounce/roll. Model for students how you want them to do this experiment. Show them how to hold their ruler vertically from the ground and how to drop their bouncy ball from the top of the ruler to the ground so it is dropped approximately one foot. Also model how you would count the number of times a ball bounces after it has been dropped. Tell students to do their best and that they can practice a few times before recording their number of bounces for each ball. Also give some examples of how partners could work together to do this experiment; i.e. one person could hold the ruler and count while the other person drops the ball from the top of the ruler. Tell students you expect them to take turns holding the ruler/ dropping the bouncy ball when they do this experiment. Then go over expectations for the students' safe use of balls before transitioning into the hall.

4. Once out in the hallway, have students sit in a circle again. Briefly review expectations for using the ball in this experiment and directions about what the students are supposed to do. Then give students a worksheet to note their observations about how the four balls bounced when tested. Tell students who their partners will be for the experiment, making partners according to students' needs and abilities.

5. Come back together as a class and make a class graph on a large sheet of paper with all the student observations/ records of which balls bounced the best and which ball bounced the least. Review concepts of "most" and "least" learned in math and have one partner come up to color in bar on the bar graph to show which of their four balls bounced the most and the other partner come up to color in a bar on the other bar graph to show which of their four balls bounced the least.

6. To wrap up the lesson take a look at the bar graphs as a class and determine which ball most groups found bounced the most and which ball most groups found bounced the least. Ask students to think about why one kind of ball might have bounced a lot and another type of ball didn't bounce as much to get them to continue thinking about properties different balls have and how the materials these balls are made of might influence their bounciness.

Materials:

-Web map

- Variety of bouncy balls (four/ each pair of students)
- Rulers (10)
- Science Notebook Page: Comparing Bounciness II worksheets (20)
- Class bar graph outlines to record “What ball bounced the most?” and “What ball bounced the least?”
- Crayons (a different color for each of the four columns on each bar graph)

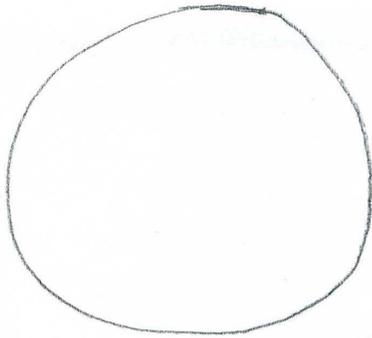
Name: _____ Date: _____

Science Notebook Page

Comparing Bounciness II

Draw a picture of each of your balls, using a different box for each drawing. Be sure to show the ball's number in your drawing. Write "1" in the box next to the best bouncer and "2" in the box next to the next-best bouncer.

Under each drawing, write the number of times that ball bounces.



Number of bounces _____



Number of bounces _____



Number of bounces _____



Number of bounces _____

Lesson 4: Experimenting with making bouncy balls

Goal: To explore the property of bounciness through making bouncy balls with a variety of materials

Procedures:

1. Have students sit on the carpet in a circle. Tell students that today they will be making their own bouncy balls to experiment with. Show a bouncy ball that you have pre-made as a model so students will have an idea of what their end product will look like. Review expectations for students while working with the materials and remind them especially that they are not to touch the materials at their tables until you have given them permission to do so. Then have students sit at their tables with everything cleared off and give students different materials and to allow them to make their own balls. First have students make a ball out of clay and then give them materials to make a ball out of borax, corn starch, and elmer's glue.
2. Give each group specific materials and a goal (i.e. make a ball that bounces the most from the materials, one that rolls the best, etc.) depending on the "what to know" questions that were consolidated and voted on earlier in the week.
3. Bring the class back together at the end and have a discussion about what each group did, what worked, what didn't work, and some ideas why. Also let each group share their bouncy ball. Start to add some things that students learned from this experiment to the "learned" section of the KWL chart.
4. If time allows have students go back to their tables and experiment with different measurements of the materials to make new bouncy balls, and have them make observations about how their balls turn out when they use more/less of a certain material.

Materials:

- Clay
- Borax
- Corn starch
- Elmer's glue-all
- Warm water
- Food coloring
- Measuring spoons
- Bowls

Lesson 5: Sink or Float Experiment

Goal: For students to explore what balls sink and what balls float when placed in water and to have them draw on what they have discovered about properties of different balls previously to come up with ideas as to why certain balls sink and others float

Procedures:

1. Display a variety of balls in front of a plastic tub of water on the carpet. Have students sit in a circle. Explain to students that you will be testing these balls to see whether they sink or float when dropped in the bin of water. Before placing each ball in the water, have students raise quiet hands to make a prediction about whether that ball will sink or float. Encourage students to give an explanation for why made the prediction they did. Allow all students then to raise their hands to indicate whether they think the particular ball you are holding will sink or float. Repeat this procedure before placing each new ball in the water. If the ball floats place it in the paper ball labeled "float" with a sticky note and if it sinks place the ball in the paper bowl labeled "sink".
2. After testing all the balls, have students take a look at the kinds of balls that we found to have

sunk and the kinds of balls that float; have them reflect on what the balls that sunk might have in common that made them sink, and what the balls that floated might have in common that made them float. Have students raise quiet hands to share their ideas.

*send home a note to parents to remind them to make sure their child sends in a circular object for show and tell the next day

Materials:

- Variety of balls
- Large plastic tub filled with water
- 2 paper bowls
- Sticky notes labeled "float" and "sink"

Show and Tell



Please remind your children to bring a circular object to school on Friday, October 26th.

We will be sharing these during circle time as part of our science unit about balls and ramps!

Show and Tell



Please remind your children to bring a circular object to school on Friday, October 26th.

We will be sharing these during circle time as part of our science unit about balls and ramps!

Lesson 6: Real life uses of balls & sink or float experiment discussion and extension

Goal: To help students connect what they have learned about balls and their properties so far to real life uses of balls; to help students think about how we might classify what is and is not a ball

Procedures:

*Adapted from <http://serc.carleton.edu/sp/mnstep/activities/27057.html> and <http://sciencenetlinks.com/lessons/sink-or-float/>

1. Have the students circle-up and share the circular object they were asked to find at home and bring in to share. (As the students arrive in the morning, ask them to raise their hands if they forgot to bring their circular object from home. If this is the case allow them to pick from a few different circular objects on hand that they would like to share. Have them pick and keep their item in their cubbie(s) until science time.)

Remind students about the rules of circle time before beginning (not talking when someone is sharing, being good listeners).

Ask students to share 1) What their object is 2) What they use it for 3) One of its properties (i.e. it bounces, it is soft, etc.)

2. Remind students of the sink/float experiment we performed as a class the last time we had science. Have students describe the objects in the sink pile and in the float pile. Ask "Do the

objects in each of the piles have anything in common with each other?" Discuss the material characteristics similarities and differences between balls that sink and objects that float. Guide students towards questions such as:

Does weight affect sinking and floating?

Does what's inside of the ball affect whether it sinks or floats?

Does the depth or amount of water matter?

Can I change a Floater into a Sinker? Or a Sinker into a Floater?

What materials are my sinkers made of? What about my floaters?

3. Bring out objects that are made of similar materials as the balls that sink and the balls that float. Have students identify what materials these objects are made of and make predictions based on their last experiment results about what objects will sink and which will float; briefly repeat experiment using objects made of similar materials to those of the balls that were previously tested.

Materials:

-Circular object example to share

-Variety of balls from the "float or sink" experiment saved in two paper bowls

-Objects made out of materials similar to the materials the balls tested in the "sink or float" experiment" are made out of

-Large plastic tub filled with water

Lesson 7:

Goal: To make comparisons about the properties of two different balls and to introduce ramps

Procedures:

1. Bring out the bouncy balls save in plastic bags that the students made from lesson 4 (a clay ball and a borax ball) and have students compare properties of these two balls including size, weight, bounciness, and ability to roll and have students record their findings on a science notebook page worksheet by drawing the ball that illustrates each of these categories in the correct box (bigger/smaller for size, etc.). Then bring students back together as a group and have them share their findings.

2. Read aloud The Berenstain Bears Ride the Thunderbolt by Stan & Jan Berenstain to introduce the idea of ramps. Ask students if they have ever been on a roller coaster and if so what was it like. Ask questions such as if they went faster or slower up the roller coast, down it, what it felt like, etc. Introduce the idea of ramps.

3. To introduce the idea of incline panes and a ramp as a class and test different properties of balls based on observations of these balls as they roll down the ramp (speed, ability to roll smoothly and in a straight line, etc.) and how this changes depending on the steepness of the ramp. Demonstrate as a class what type of ball will roll fastest down a wooden ramp; have students make predictions and use a timer to see how long it takes different balls to roll down the same ramp positioned at the same angle each time. Tell students that the next day they will be doing experiments of different ramps to see which help the ball(s) roll the best/fastest.

Materials:

- The Berenstain Bears Ride the Thunderbolt by Stan & Jan Berenstain

-Cardboard ramp

-Plastic ramp base

-Variety of balls

Name: _____ Date: _____

Science Notebook Page

Comparing Balls

SIZE	
BIGGER	SMALLER

WEIGHT	
HEAVIER	LIGHTER

BOUNCINESS	
MORE BOUNCY	LESS BOUNCY

ABILITY TO ROLL	
BETTER	WORSE

Lesson 8: Real life uses of inclined planes (slopes and ramps)

Goal: To connect the experiment with balls and ramps to real life instances of objects on incline planes

Procedures:

1. Discuss with students how roadways and balls may remind them of experiences they have had.

Ask questions such as:

"Have you ever rolled down a hill? Been on a roller coaster? A sled, go-cart, bike, or skateboard on a hill?"

"What did it feel like?"

"How did you start yourself going down? How did you stop?"

Then ask students if any of them have seen ramps for people in wheelchairs and on crutches.

"Where have you seen ramps?"

"How does it make movement easier?"

2. Show students a short video about how the Egyptians used inclined planes to make it easier for them to build the pyramids:

<http://www.youtube.com/watch?v=tvLDkNdDrqY>

Ask students to share something they learned after watching the video,

"Why did the Egyptians use inclined planes to build the pyramids?"

"How did using inclined planes make the Egyptians work easier and fast?"

"What would they have to do to build the pyramids if they didn't have or use inclined planes?"

3. Have students illustrate a picture of a real life ramp they have seen. Have them tell you what they plan to draw before handing out a paper, use crayons to illustrate the picture, and try their best to sound out what they wrote- underwrite students as they finish and you check their papers.

Have students come back together on the carpet in a circle to share their ramp drawings.

Materials:

-Video clip: <http://www.youtube.com/watch?v=tvLDkNdDrqY>

-Blank paper

-Crayons

Lesson 9: To make conclusions about balls they have interacted with and their properties; to reflect on how experiments they have done with balls and ramps translates to real life uses of inclined planes

Goal:

Procedures:

1. Have students sit in a circle. Ask students to think about the ball activities they have done and ask them questions such as:

"How do you make the balls move?"

"What started them?"

"What stopped them?"

"What made them move in a particular way?"

"Can balls ever move by themselves? How?"

2. Ask students to think about how they could make some ramps in the classroom to see how their balls roll. Put students into pairs and give them the choice of seeing how their balls roll either by using a wooden ramp you have or by making a ramp using materials in the classroom. Have students tell you what materials/how they plan to make a ramp in the classroom before they go do it if they choose this option by creating a "blue print" of the ramp they are going to build

on a piece of blank paper. Their blueprint should include a picture of their ramp that depicts what materials they are using to make their ramp and should also include a question (sounded out on their own that the teacher can underwrite) they wish to explore in terms of how their ball(s) will interact with the ramp they are going to build.

3. Give students two balls per group to build and test their ramps and allow time for students to make/ test balls out on their ramps. Tell them beforehand to be thinking about two things they find as they test their balls to share with the class.

As you walk around and supervise groups, ask questions such as:

"What did this big ball do when it rolled down this ramp?"

"Can you tell me how you rolled the ball?"

"How did the ball move at the top of the ramp? in the middle? at the end?"

"Did it slow down? When? How?"

"What if the ramp goes up again- what do you think the ball would do?"

"What happens if the balls hit each other?"

4. Bring the class back together in a circle; have students sit with their partners and bring their balls with them to help describe what they did as they tested them on their ramps. Guide the discussion by asking questions such as:

Describe something exciting/interesting you did.

"What did you do to the ramp to make that happen?"

"How did you start the ball?"

"What did the ball do? look like?"

"Did you notice any similarities between the way the balls rolled down the ramp?"

"Did you notice any differences between the way the balls rolled down the ramp?"

"How well did they roll? Why do you think this was true?"

"What made them slow down quickly?"

"How far do things go when they roll down your ramp? How can you make them go further?"

"What happens when you raise or lower the ramp?"

"How do you think you could make an object roll faster? Roll slower?"

Assessment- During class discussion of the activity check to see that students are using descriptive words to explain the motion of their balls (i.e. faster, slower, backwards, higher) and that students are trying to give an explanation or why their balls behaved a certain way

5. Show students some real life examples of ramps. Read aloud selected parts of the book Simple Science: Slopes by Caroline Rush, especially highlighting areas of interest for the students as determined by what the students choose to draw when they made drawings of real life inclined planes.

6. Complete the "learned" section of the KWL chart by having students share what they have learned about balls and simple machines throughout the unit.

Materials:

-Variety of balls

-Cardboard ramps, plastic ramps, and other classroom materials available from which students can construct ramps

-Simple Science: Slopes by Caroline Rush

Calendar

Sun	Mon	Tues	Wed	Thu	Fri	Sat
No School	Day 1	Day 2	Day 3	Day 4	Day 5	No School
	Lesson 1- Introducing balls:	Lesson 2- Exploring balls and their properties	Lesson 3- Comparing bounciness experiment	Lesson 4- Making bouncy balls experiment	Lesson 5- Sink or float experiment	
	Goal: To get students thinking about balls, what they can do, and what questions they have about them	Goal: To give students the opportunity to explore balls and their properties in a hands on way and collectively record observations in a "word web" graphic organizer	Goal: To engage students in an investigative experiment to determine what kind of ball bounces the most and the least	Goal: To extend student thinking about what gives a ball the property of "bounciness" through creation to two bouncy balls out of different materials	Goal: To test a variety of balls to determine what kinds of balls sink, what kinds of balls float, and why these balls might behave this way	
	(30 minutes)	(30 minutes)	(45 minutes)	(45 minutes)	(30 minutes)	
No School	Day 6	Day 7	Day 8	Day 9		No School
	Lesson 6- Real life uses of balls and sink or float experiment extended	Lesson 7- Comparing balls & introducing ramps	Lesson 8- Real life uses of inclined planes	Lesson 9- Inclined planes (continued) and unit wrap-up		

	Goal: To help students make meaningful connections between balls and their real life uses; to extend the sink or float experiment	Goal: For students to compare some properties of the balls they made during lesson 4 and to introduce the concept of inclined planes	Goal: To connect experiment about balls and ramps to real life uses of inclined planes	Goal: For students to plan and create their own ramp and to test how balls behave on this ramp; to continue to reflect on inclined planes and their real life uses		
	(30 minutes)	(30 minutes)	(30 minutes)	(45 minutes)		

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