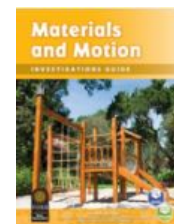


Investigation 1 - Getting to Know Wood

Students work with five different wood samples to observe their properties. They begin with free exploration, go on a hunt for matching samples, drop water on the samples, and float them in basins. They test the wood to find out how many paper clips it takes to sink it, then organize their results by making a concrete graph. Students use sandpaper to change the shape of wood. They compare sawdust and shavings and how they interact with water. They simulate the manufacture of two kinds of wood—particleboard and plywood.

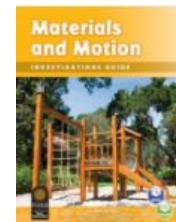


Standards - K-ESS3-3, K-2 ETS1-1, K-2 ETS1-2

Investigation 1	Summary of Lesson	Priority
Part 1: Observing Wood	<p>Students become familiar with different kinds and forms of wood found in their home and school environments. Students compare and describe five uniform samples of different kinds of wood, learn the names, and observe how the woods are alike and different. Students go on a wood hunt in the classroom and label wood objects. They go outdoors to find wood.</p> <p><i>Read, "The Story of a Chair".</i></p> <p><i>FQ - Where does wood come from? What is made of wood?</i></p>	<p>High</p> <p>Introduction to types of wood and content vocabulary and basic concept of wood, where does it come from. Instead of planning a separate trip outside to make observations, you could do this at the end of a recess. This could reduce the length of the lesson.</p>
Part 2: Wood and Water	<p>Students observe how wood and water interact, first by putting drops of water on the wood, then by putting the wood in basins of water.</p> <p><i>FQ - What happens when wood gets wet?</i></p>	<p>High</p> <p>Introduction to scientific vocabulary and basic inquiry skills. Instead of planning a separate trip outside to make observations, you could do this at the end of a recess. This could reduce the length of the lesson.</p>
Part 3: Testing a Raft	<p>Students find ways to sink floating wood samples by attaching paper clips to the wood with rubber bands. Students discover how easy it is to sink the plywood compared to the pine sample. Students refine their techniques for sinking wood samples, and they test two other kinds of wood. Students make a bar graph of their results to find a kind of wood to make a raft to hold passengers.</p> <p><i>FQ - How can you sink wood? How many passengers will a wood raft hold?</i></p>	<p>High</p> <p>Introduction to scientific vocabulary and basic inquiry skills.</p> <p>The raft activity is crucial as it meets standard K-2 ETS1-2.</p>
Part 4: Sanding Wood	<p>Students add to their knowledge of the properties of wood and learn how to use those properties to change wood. Students use sandpaper to change the shape of basswood and a stick.</p> <p><i>FQ - How can you change the shape of wood?</i></p>	<p>Medium</p> <p>This lesson is a build up to Parts 5-7, meeting the standard K-ESS3-3 and K-2 ETS1-2. Students are being introduced to very real world issues.</p>

Investigation 1 cont. - Getting to Know Wood

Students work with five different wood samples to observe their properties. They begin with free exploration, go on a hunt for matching samples, drop water on the samples, and float them in basins. They test the wood to find out how many paper clips it takes to sink it, then organize their results by making a concrete graph. Students use sandpaper to change the shape of wood. They compare sawdust and shavings and how they interact with water. They simulate the manufacture of two kinds of wood—particleboard and plywood.



Standards - K-ESS3-3, K-2 ETS1-1, K-2 ETS1-2

<p>Part 5: Sawdust and Shavings</p>	<p>Students compare sawdust and shavings. They find out what happens to sawdust and shavings when they mix the two with water and then separate out the shavings. Students spread out wet sawdust on paper plates and observe it after a few days.</p> <p><i>FQ - How are sawdust and shavings the same? How are sawdust and shavings different?</i></p>	<p>Medium</p> <p>This lesson ties into Parts 5-7, meeting the standard K-ESS3-3 and K-2 ETS1-2. Students are being introduced to very real world issues.</p>
<p>Part 6: Making Particleboard</p>	<p>Students simulate the making of particleboard by using sawdust and a cornstarch matrix. They compare their particleboard with the samples from the kit.</p> <p><i>Video, "What is Agriculture?"</i></p> <p><i>FQ - How is particleboard made?</i></p>	<p>Medium</p> <p>This lesson ties into Parts 5-7, meeting the standard K-ESS3-3 and K-2 ETS1-2. Students are being introduced to very real world issues.</p>
<p>Part 7: Making Plywood</p>	<p>Students make plywood from the strips of wood and glue. They compare the breakable strength of a craft stick to that of their homemade plywood.</p> <p><i>Read, "Are you an Engineer?"</i></p> <p><i>FQ - How is plywood made?</i></p>	<p>Medium</p> <p>This lesson ties into Parts 5-7, meeting the standard K-ESS3-3 and K-2 ETS1-2. Students are being introduced to very real world issues.</p>

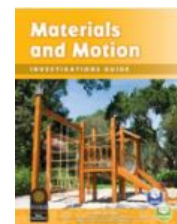
K-ESS3-3 Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

K-2 ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2 ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Investigation 2 - Getting to Know Paper

Students observe and compare the properties of ten kinds of paper and go on a hunt for matching samples. They compare how well the papers fold and which has the best surface for writing. They test papers for absorption, then soak the samples overnight. Students learn how to recycle paper by making new paper from old and crafting papiermâché bowls.



Standards - K-ESS3-3, K-2 ETS1-1, K-2 ETS1-2

Investigation 2	Summary of Lesson	Priority
Part 1: Paper Hunt	<p>Students observe and compare the properties of ten kinds of paper. They go on a paper hunt, looking for a sample that matches one that they are given. Students place labels around the classroom to highlight all the items in their environment made of paper.</p> <p><i>Read, "The Story of a Box".</i></p> <p><i>FQ - What is made of paper?</i></p>	<p>Medium</p> <p>Students are being exposed to vocabulary around paper. However, to conserve time, you could always have student forgo the "paper hunt".</p>
Part 2: Using Paper	<p>Students use crayons, pencils, and marking pens to explore and compare the properties of paper that make it suitable or unsuitable for writing and drawing. Students fold paper and compare the properties of paper that allow it to be folded.</p> <p><i>FQ - What makes paper good for writing? What makes paper easy to fold?</i></p>	<p>High</p> <p>Students are being exposed to vocabulary around paper.</p>
Part 3: Paper and Water	<p>Students drop water on ten different paper samples and observe and compare the results. They submerge the paper in water and let it dry to see if the paper change in any way. Students decorate paper flags and hang them on a string outdoors to observe the paper over time.</p> <p><i>FQ - What happens when water gets wet?</i></p>	<p>Medium</p> <p>You could skip the "making the flag" activity. (However, this activity is important for building content knowledge on .)</p>
Part 4: Paper Recycling	<p>Students are introduced to papermaking and recycling. They shake toilet tissue and water in a bottle to make a pulp and then form it into a new sheet of paper. Students discover that the new paper has many of the properties of the original paper and also has some very different properties.</p> <p><i>FQ - How can new paper be made from old paper?</i></p>	<p>Medium</p> <p>This lesson connects into Parts 5-6, meeting the standard K-ESS3-3 and K-2 ETS1-2. Students are being introduced to very real world issues.</p>
Part 5: Papier-Mache	<p>Students use wheat paste (flour and water) to mold strips of newspaper over a small container. They use the papier-mache technique to change the paper from flexible to stiff and strong so it will keep a shape.</p> <p><i>FQ - How can paper be used to make things?</i></p>	<p>Medium</p> <p>This lesson connects into Parts 5-6, meeting the standard K-ESS3-3 and K-2 ETS1-2. Students are being introduced to very real world issues.</p>

Investigation 2 cont. - Getting to Know Paper

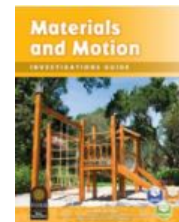
K-ESS3-3 Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

K-2 ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Investigation 3 - Getting to Know Fabric

Students observe and compare the properties of ten kinds of fabric and search for different ways fabrics are used. They take apart fabrics to learn how they are woven from threads. Students investigate how fabrics interact with water. They consider the properties of different fabrics and decide which fabric are good choices for clothing. Students plan how they can conserve, reuse, and recycle. They observe the warming effect of the Sun and design a structure to reduce the effect of heating.



Standards - 2-PS1-2, K-PS3-1, K-PS3-2, K-ESS3-3, K-2 ETS1-1, K-2 ETS1-2, K-2 ETS1-3

Investigation 3	Summary of Lesson	Priority
Part 1: Feely Boxes and Fabric Hunt	<p>Students observe the properties of ten different fabrics (burlap, corduroy, denim, fleece, knit, ripstop nylon, satin, seersucker, sparkle organza, and terry cloth) Students match properties by using feely boxes, hunting for fabric, and locating fabrics that are used in the classroom.</p> <p><i>FQ - How are fabrics different? What is made of fabric?</i></p>	<p>Medium</p> <p>Students are being exposed to vocabulary around fabric. However, to conserve time, you could always have student close their eyes rather than using “feely boxes/bags”, and forgo the “fabric hunt”.</p>
Part 2: Taking Fabric Apart	<p>Students investigate the structure of woven fabrics by disassembling and comparing loosely woven burlap and tightly woven wool plaid.</p> <p><i>Read, “What is Fabric Made From?” Video, “What is Agriculture?” Activity, “Weave a Pattern”</i></p> <p><i>FQ - How is fabric made?</i></p>	<p>Medium</p> <p>Students are exposed to vocabulary around fabric and how it is made. However, the pulling apart of the fabric might be difficult for some students and could be done whole group. The reading and other activities could provide more information for students.</p>
Part 3: Water and Fabric	<p>Student investigation how fabrics interact with water. They discover the many ways the different fabrics absorb, transmit, and repel water. Students immerse fabric in water and observe that it is unchanged after it dries - the water evaporates.</p> <p><i>FQ - What happens when water gets on fabric?</i></p>	<p>Medium</p> <p>This lesson connects into Parts 4, meeting the standard K-ESS3-3 and K-2 ETS1-2. Students are being introduced to very real world issues.</p>
Part 4: Graphing Fabric Uses	<p>Students think about the kinds of fabric that would make a good pair of pants and other items of clothing. They prepare picture graphs that represent their decisions regarding the fabric they would use for different kinds of clothing.</p> <p><i>Read, “How are Fabrics Used?”</i></p> <p><i>FQ - How are different kinds of fabric used?</i></p>	<p>Low</p> <p>Although this lesson connected well with Part 3, it could be skipped or done during “math” time. It does connect well with standard K-2 ETS1-3.</p>

<p>Part 5: Reuse and Recycle Resources</p>	<p>Students are introduced to natural resources and the need to reuse and recycle materials. They sort materials for recycling, based on the kind of material. Students use magnets to sort steel from other metals.</p> <p><i>Read, "Land, Air, and Water" and Sing, "I am wood". Video, "Reduce, Reuse, and Recycle." and "Clothing and Building Materials". Activity, "Recycling Center".</i></p> <p><i>FQ - How can we conserve natural resources?</i></p>	<p>Low</p> <p>This activity could be skipped. Students could read, watch the videos and participate in the online activity.</p>
<p>Part 6: Building Structures</p>	<p>Students place cups of water outdoors in the sunshine and shade and compare the water temperature after at least 15 minutes. They observe that cups of water in direct sunlight get warmer. Students are challenged to design and build a structure, using wood, paper, fabric, glue and natural materials that will keep water cool in the sunshine. Students use the knowledge they have gained in the previous parts of the module to design their structures.</p> <p><i>FQ - What happens to water in sunshine and shade? How can we design a structure to keep water cool in sunshine?</i></p>	<p>Low</p> <p>Although this directly meets standard K-PS3-2, it seems like this <i>Part</i> could take multiple days to complete. Students could complete the first part, of comparing water temperatures outside, then brainstorm as a class how to build a structure. As an extension, students could take this challenge home and complete with their families.</p>

2-PS1-2 (foundational) Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

K-PS3-1 Make observations to determine the effect of sunlight on Earth's surface.

K-PS3-2 Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on an area.

K-ESS3-3 Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.

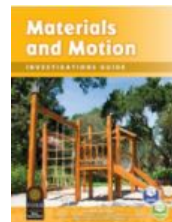
K-2 ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2 ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-2 ETS1-3 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Investigation 4 - Getting Things to Move

Students investigate the strength of pushes and pulls needed to move objects. They use gravity to pull balls down slopes to investigate collisions. Students find ways to change the strength and direction of the pull on a rolling ball to meet design challenges. Students change the strength of the push on a balloon rocket flying on a line to explore cause and effect.



Standards - K-PS2-1, K-PS2-2, K-2 ETS1-1, K-2 ETS1-2, K-2 ETS1-3

Investigation 4	Summary of Lesson	Priority
Part 1: Pushes and Pulls	<p>Students observe and describe how push or pull causes something to move. They roll balls at different speeds (slow and fast) and determine the strength of the push required to achieve a certain speed. They are introduced to gravity as a pulling force.</p> <p><i>Read, "Pushes and Pulls?"</i></p> <p><i>FQ - What causes objects to move?</i></p>	<p>High</p> <p>Introduction to types of forces and content vocabulary.</p>
Part 2: Colliding Objects	<p>Students use balls and ramps to achieve different speeds. They explore what happens when a moving ball hits an object. Students change the speed of the ball by changing the slope of the ramp to knock over blocks. They apply their knowledge of ball motion to make a ball land in a particular spot.</p> <p><i>Read, "Collisions"</i></p> <p><i>FQ - What happens when objects collide?</i></p>	<p>High</p> <p>Students are exposed to more content vocabulary around forces. The design challenge directly meets standards K-PS2-1 and K-PS2-2, one of <i>the only times this standard is addressed</i>.</p>
Part 3: Rolling Outdoors	<p>Students find slopes in the schoolyard that can be used to set balls in motion. Each group uses a plastic bottle as a target to predict the path of a ball on a slope.</p> <p><i>FQ - Where can balls roll on the schoolyard?</i></p>	<p>High</p> <p>This activity reinforces the core idea of slope and gravity.</p>
Part 4: Balloon Rockets	<p>Students observe a balloon-rocket system to find out how far the air in the balloon will propel the system along the flight line. The class investigates how changing the strength of the push (number of pumps of air in the balloon) changes the speed of the balloon rocket and how far it travels. Students also observe what happens to the system when it collides with an object on the flight line.</p> <p><i>FQ - How can we change how far a balloon rocket travels?</i></p>	<p>High</p> <p>The design challenge directly meets standards K-PS2-1 and K-PS2-2, one of <i>the only times this standard is addressed</i>.</p>
Assessment		

Investigation 4 cont. - Getting Things to Move

K-PS2-1 Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

K-PS2-2 Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

K-2 ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2 ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-2 ETS1-3 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.