



San Diego Unified School District  
Science Department

**Grade 2 – Balance and Motion**  
Physical Science  
**Unit of Study**



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**Science Vision for  
San Diego Unified School District**  
Science is an integral part of the intellectual development of a child. Interest in science begins with attitudes and values established in the earliest years through daily experiences. Students graduating from high school must have a foundation in scientific knowledge and evidence based reasoning.

Updated versions of this unit of study can be found online at [www.sandi.net/science](http://www.sandi.net/science).



**Grade 2 – Balance and Motion  
Module Overview**



**Overview of the Unit**

We live in a dynamic world where everything is in motion, or so it seems. But not everything is moving the same way. Some things move from one place to another. Others rotate around and around. Still other things are stationary, stable for a time, balanced on a thin line between stop and go. These are the global phenomena that students experience in the Balance and Motion Module.

**Grade 2 Physical Science Conceptual Flow**

**Concept #1**  
The motion of objects and be observed and measured.

<b>Subconcepts</b> <b>Investigation #1: The First Straw</b>	<b>Subconcepts</b> <b>Investigation #2: Balance</b>	<b>Subconcepts</b> <b>Investigation #3: Spinners</b>
The meter is the standard metric unit of linear measurement; 100 centimeters make a meter.	Objects can be balanced in many ways.	A force is a push or pull; gravity is a pulling force.
Length us how far it is from one point to another.	A stable position is one that is steady; the object is not falling over.	Objects and systems that turn on a central axis exhibit rotational motion.
	Counterweights positioned in certain ways can help balance an object.	The amount and position of mass affect how an object rotates.
	A mobile is a system of balanced beams and objects.	The motion of an object can be changed by pushing or pulling.

**Concept #1 (continued)**

The motion of objects and be observed and measured.

**Subconcepts  
Investigation #4: Rollers**

Wheels and spheres roll down a slope because of gravity.

Wheel-and-axle systems with wheels of different sizes roll toward the smaller wheel.

The amount and location of mass can change the way a system rolls.

**Subconcepts  
Investigation #5: Back and Forth**

Sound is caused by vibrations.

Pitch is how high or low a sound is; differences in pitch are caused by differences in the rate at which objects vibrate.

Volume is how loud or soft a sound is.

**Subconcepts  
Investigation #6: Magnets and Tools**

Two magnets attract or repel when they come together.

The magnetic force (push or pull) acts through space and most materials.

Tools and machines can apply forces to make things move.

## 2<sup>nd</sup> Grade Science Content Standards Addressed in this Module

### Physical Science

PS1 The motion of objects can be observed and measured.

PS1a Students know the position of an object can be described by locating it in relation to another object or to the background.

PS1b Students know an object's motion can be described by recording the change in position of the object over time.

PS1c Students know the way to change how something is moving is by giving it a push or a pull. The size of the change is related to the strength, or the amount of force, of the push or pull.

PS1d Students know tools and machines are used to apply pushes and pulls (forces) to make things move.

PS1e Students know objects fall to the ground unless something holds them up.

PS1f Students know magnets can be used to make some objects move without being touched.

PS1g Students know sound is made by vibrating objects and can be described by its pitch and volume.

### Investigation and Experimentation

I&E4 Scientific progress is made by asking meaningful questions and conducting careful investigations

I&E4a Make predictions based on observed patterns and not random guessing.

I&E4b Measure length, weight, temperature, and liquid volume with appropriate tools and express those measurements in standard metric system units.

I&E4d Write or draw descriptions of a sequence of steps, events, and observations.

I&E4g Follow oral instructions for a scientific investigation.

## Pacing the Unit as a Whole

<b>Day 1</b> Start Inv. 1 Part 1 A	<b>Day 2</b> A/W	<b>Day 3</b> Start Inv. 1 Part 2 A/W	<b>Day 4</b> Start Inv. 1 Part 3 A/W	<b>Day 5</b> Review	<p><b>A – Active Investigation</b> sessions include firsthand observations about energy and matter, active thinking about the experiences, small group discussion, simulations, writing in science notebooks, learning new vocabulary in context, viewing a video, and completing written embedded assessments to inform instruction. (Approximately 60 minutes)</p> <p><b>W – Wrap-up</b> sessions are teacher-directed vocabulary reinforcement and science content review. (Approximately 30 minutes)</p> <p><b>R – Reading</b> sessions (<i>Science Resources</i> book) include individual and interactive reading, answering review questions, and discussing the reading to ensure that students integrate the information. (Approximately 30 minutes)</p>
<b>Day 6</b> Start Inv. 2 Part 1 A/W	<b>Day 7</b> Start Inv. 2 Part 2 A	<b>Day 8</b> A/W	<b>Day 9</b> Start Inv. 2 Part 3 A/W	<b>Day 10</b> R	
<b>Day 11</b> Start Inv. 2 Part 4 A/W	<b>Day 12</b> Review	<b>Day 13</b> Start Inv. 3 Part 1 A	<b>Day 14</b> A/W	<b>Day 15</b> R	
<b>Day 16</b> Start Inv. 3 Part 2 A/W	<b>Day 17</b> Start Inv. 3 Part 3 A	<b>Day 18</b> A/W	<b>Day 19</b> R	<b>Day 20</b> Review	
<b>Day 21</b> Start Inv. 4 Part 1 A/W	<b>Day 22</b> Start Inv. 4 Part 2 W/R	<b>Day 23</b> R	<b>Day 24</b> Start Inv. 4 Part 3 A	<b>Day 25</b> A/W	
<b>Day 26</b> R	<b>Day 27</b> Review	<b>Day 28</b> Start Inv. 5 Part 1 A/W	<b>Day 29</b> Start Inv. 5 Part 2 A/W	<b>Day 30</b> R	
<b>Day 31</b> Start Inv. 6 Part 1 A/W	<b>Day 32</b> R	<b>Day 33</b> Start Inv. 6 Part 2 A/W	<b>Day 34</b> R	<b>Day 35</b> Administer End-Of-Module Assessment	



**Grade 2 – Balance and Motion**  
**Pacing Guide – Investigation 1: First Straw**



**Investigation Overview**

<p><b>Investigation 1: First Straw</b>  <b>Concept: The motion of objects and be observed and measured.</b>          Students learn the need for standard units of linear measurement. They measure objects with nonstandard units (straws), and then use a meter tape to measure objects in meters and centimeters. Later they apply linear metric measures to study motion.</p>		
<b>Part 1: Finding a Standard</b>	<b>Part 2: Estimating and Measuring</b>	<b>Part 3: Making Comparisons</b>
<p><u>Summary</u>          Students discover the need for a standard unit to accurately measure length. They use an arbitrary unit (a drinking straw) to measure their desks. When they realize that the straws are not all the same length (not standard), the meter is introduced as the standard metric unit for measuring.</p>	<p><u>Summary</u>          Students practice estimating and measuring in standard metric units: meter and centimeter. They look for personal references to help them estimate, and use meter tapes to measure a variety of objects.</p>	<p><u>Summary</u>          Students practice linear metric measurement by measuring different parts of the body. They predict which will be greater, arm span or height, and then they measure to confirm their predictions.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ A measurement standard is a unit agreed upon and used by a large number of people.</li> <li>▪ A meter is the standard metric unit for measuring length or distance.</li> <li>▪ A centimeter is 1/100 of a meter; it takes 100 cm to make a meter.</li> <li>▪ Length is how far it is from one point to another.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ An estimate is a guess based on some reference or prior knowledge.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Apply content introduced in previous part</li> </ul>
<p><u>Time Allocation</u>          Active Investigation/Wrap-Up: 2 days</p>	<p><u>Time Allocation</u>          Active Investigation/Wrap-Up: 1 day</p>	<p><u>Time Allocation</u>          Active Investigation/Wrap-Up: 1 day          Review: 1 day</p>
<p><u>CA Science Standards</u>          I&amp;E4b</p>	<p><u>CA Science Standards</u>          I&amp;E4b</p>	<p><u>CA Science Standards</u>          I&amp;E4a, I&amp;E4b</p>



**Grade 2 – Balance and Motion**  
**Pacing Guide – Investigation 1: The First Straw**

**Pacing Guide – Investigation 1: The First Straw**

Day 1		Day 2		Day 3	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Read “Science Background” <i>TG p. 6-9</i> <input type="checkbox"/> Read “At a Glance” <i>TG p. 38-39</i> <input type="checkbox"/> Read “Background for the Teacher” <i>TG p. 40</i> <input type="checkbox"/> Read “Teaching Children About Metric Measurement” <i>TG p. 41-42</i> <input type="checkbox"/> Watch Video demo of Inv. 1, Pt 1 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 43-45</i>	Guiding the Investigation <input type="checkbox"/> “Part 1: The First Straw” Steps 1-11 <i>TG p. 46-48</i>		Guiding the Investigation <input type="checkbox"/> “Part 1: The First Straw; Wrapping up Part 1” Steps 11-16 <i>TG p. 48-50</i>	<input type="checkbox"/> Watch Video demo of Inv. 1, Pt 2 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 51-52</i>	Guiding the Investigation <input type="checkbox"/> “Part 2: Estimating and Measuring” and “Wrapping up Pt 2” Steps 1-7 <i>TG p. 53-54</i>  <input type="checkbox"/> <b>Body of Evidence Prompt #1</b> <i>TG p.213</i>
Day 4		Day 5			
Prep	Instruction	Prep	Instruction		
<input type="checkbox"/> Watch Video demo of Inv. 1, Pt 3 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 55-56</i>	Guiding the Investigation <input type="checkbox"/> “Part 3: Making Comparisons” and “Wrapping up Pt 3” Steps 1-10 <i>TG p.57-59</i> <input type="checkbox"/> <b>Body of Evidence Prompt #2</b> <i>TG p.214</i>		<input type="checkbox"/> Review <input type="checkbox"/> Interdisciplinary Extensions <i>TG p. 60-63</i>		



**Grade 2 – Balance and Motion**  
**Pacing Guide – Investigation 2: Balance**



**Investigation Overview**

**Investigation 2: Balance**

**Concept: The motion of objects and be observed and measured.**

Students explore numerous ways to balance two-dimensional shapes made out of tagboard by positioning counterweights (clothespins) in strategic locations. They make mobiles to apply their understanding of a stable position.

**Part 1: Trick Crayfish**

Summary

Students balance a tagboard cutout of a crayfish on their fingers. After finding the balance point, students are challenged to balance the crayfish on its edge, its tail, and its “nose,” using clothespins as counterweights. Students describe the position of the counterweights in relation to the crayfish balancing system.

Subconcepts

- Objects can be balanced in many ways
- Counterweights can help balance on object.
- Counterweighting can change the way an object balances.
- The position of an object can be described by locating it in relation to another object.

Time Allocation

Active Investigation/Wrap-Up: 1 day

CA Science Standards

PS1a, I&E4g

**Part 2: Triangle and Arch**

Summary

Students balance tagboard geometric shapes in a variety of ways on the end of a craft stick, using clothespins as counterweights. They try to find as many ways as possible to establish stable positions, so that a push on the object will make it wobble but not fall. Students predict whether objects will be stable on their experience, and test their predictions.

Subconcepts

- A stable position is one that is steady; the object in not falling over.
- The place on which an object balances is called the balance point.
- Counterweights should be placed low on an object in relation to the balance point.

Time Allocation

Active Investigation/Wrap-Up: 2 days

CA Science Standards

PS1a, I&E4a, I&E4g

## Investigation Overview (continued)

<p><b>Investigation 2: Balance</b>  <b>Concept: The motion of objects and be observed and measured.</b>          Students explore numerous ways to balance two-dimensional shapes made out of tagboard by positioning counterweights (clothespins) in strategic locations. They make mobiles to apply their understanding of a stable position.</p>	
<p><b>Part 3: The Pencil Trick</b></p>	<p><b>Part 4: Mobiles</b></p>
<p><u>Summary</u>          Students use a piece of soft wire and clothespins to balance a pencil on its point in a stable positions. They describe the position of the counterweights in relation to the crayfish balancing system. Students draw a sequence of steps to reach a balanced system. They read about and view photos of objects and people and discuss whether each photo shows a stable position.</p>	<p><u>Summary</u>          Students make mobiles to confirm developing concepts of balance, counterbalance, and stability.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Counterweights could be placed low on or below an object in relation to the balance point</li> <li>▪ The position of an object can be described by relating its location to another object.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ A mobile is a system of balanced beams and objects.</li> <li>▪ The position of an object can be described by locating it in relation to another object.</li> </ul>
<p><u>Time Allocation</u>          Active Investigation/Wrap-Up: 1 day          Reading: 1 day</p>	<p><u>Time Allocation</u>          Active Investigation/Wrap-Up: 1 day          Reading: 1 day</p>
<p><u>CA Science Standards</u>          PS1a, I&amp;E4a, I&amp;E4d, I&amp;E4g</p>	<p><u>CA Science Standards</u>          PS1a, I&amp;E4b, I&amp;E4g,</p>



**Grade 2 – Balance and Motion**  
**Pacing Guide – Investigation 2: Balance**



**Pacing Guide – Investigation 2: Balance**

Day 6		Day 7		Day 8	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Read “At a Glance” <i>TG p. 66-67</i> <input type="checkbox"/> Read “Background for the Teacher” <i>TG p. 68-69,</i> <input type="checkbox"/> Read “Teaching Children About Balance” <i>TG p. 70-71</i> <input type="checkbox"/> Watch Video demo of Inv. 2, Pt 1 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 72-73</i>	Guiding the Investigation <input type="checkbox"/> “Part 1: Trick Crayfish; Wrapping up Part 1” Steps 1-12 <i>TG p. 74-77</i>	<input type="checkbox"/> Watch Video demo of Inv. 2, Pt 2 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 78-79</i>	Guiding the Investigation <input type="checkbox"/> “Part 2: Triangle and Arch” Steps 1-7 <i>TG p. 80-81</i>		Investigation <input type="checkbox"/> “Part 2: Triangle and Arch; Wrapping up Part 2” Steps 8-11 <i>TG p. 82</i>
Day 9		Day 10		Day 11	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Watch Video demo of Inv. 2, Pt 3 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 83-84</i>	Guiding the Investigation <input type="checkbox"/> “Part 3: The Pencil Trick; Wrapping up Part 3” Steps 1-15 <i>TG p. 85-87</i>		<input type="checkbox"/> Reading in Science Resources, Steps 16-19 <i>TG p. 88-89</i>  Student Reading: Science Resources p. 3-10 <input type="checkbox"/> <b>Body of Evidence Prompt #3</b> <i>TG p.216</i>	<input type="checkbox"/> Watch Video demo of Inv. 2, Pt 4 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 90-92</i>	Guiding the Investigation <input type="checkbox"/> “Part 4: Mobiles; Wrapping up Part 4” Steps 1-9 <i>TG p. 93-94</i>

**Pacing Guide – Investigation 2: Balance (continued)**

<b>Day 12</b>	
<b>Prep</b>	<b>Instruction</b>
	<input type="checkbox"/> Review <input type="checkbox"/> “Interdisciplinary Extensions” <i>TG p. 95-98</i>



**Grade 2 – Balance and Motion**  
**Pacing Guide – Investigation 3: Spinners**



**Investigation Overview**

**Investigation 3: Spinners**

**Concept: The motion of objects can be observed and measured.**

Students explore the variables that influence the spinning of a top, a zoomer, and twirlers (flying spinners). They explore the forces (pushes and pulls) that make tops and zoomers move. They observe the force of gravity causing objects to fall (twirlers).

<b>Part 1: Tops</b>	<b>Part 2: Zoomers</b>	<b>Part 3: Twirlers</b>
<p><u>Summary</u> Students make tops from plastic disks and shafts, and spin them. After finding the arrangement of parts that produces the best top, the make tops from other materials. Students are introduced to force as a push or pull and gain experience applying different amounts of force to make tops spin. They see that a larger force makes the top spin faster. Students read about and discuss forces and gravity.</p>	<p><u>Summary</u> Students use disks and a length of string to make zoomers, following oral instructions. They measure the length of the complete zoomer and then use a force (pulling force) to set it into motion. The strength of the pull determines the speed of the spin.</p>	<p><u>Summary</u> Students make twirlers (flying spinners) that rotate by air resistance, first modifying soda straws with wings, and then making twirly birds from paper and paper clips. Students discuss the force that pulls the twirlers down to Earth gravity. Students read about and discuss the motion of spinning objects.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Objects and systems that turn on a central axis exhibit rotational motion.</li> <li>▪ You need a force (push or pull) to start a top spinning.</li> <li>▪ The greater the force, the faster the top spins.</li> <li>▪ The amount and position of mass affect how the object rotates.</li> <li>▪ Gravity is a pulling force that causes things to fall to the ground.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ There are different ways to initiate rotational motion.</li> <li>▪ The motion of an object can be changed by pushing or pulling.</li> <li>▪ Tops and zoomers both spin, but in different ways.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Variations in design can influence the rotational motion of spinning objects.</li> <li>▪ Air resistance can act as the force that initiates rotational motion.</li> <li>▪ Gravity is a pulling force that causes things to fall to the ground.</li> </ul>
<p><u>Time Allocation</u> Active Investigation/Wrap-Up: 2 days Reading: 1 day</p>	<p><u>Time Allocation</u> Active Investigation/Wrap-Up: 1 day</p>	<p><u>Time Allocation</u> Active Investigation/Wrap-Up: 2 days Reading: 1 day Review: 1 day</p>
<p><u>CA Science Standards</u> PS1a, PS1b, PS1c, I&amp;E4a, I&amp;E4g</p>	<p><u>CA Science Standards</u> PS1a, PS1c, I&amp;E4b, I&amp;E4g</p>	<p><u>CA Science Standards</u> PS1a, PS1e, I&amp;E4a, I&amp;E4d</p>



**Grade 2 – Balance and Motion**  
**Pacing Guide – Investigation 3: Spinners**



**Pacing Guide – Investigation 3: Spinners**

Day 13		Day 14		Day 15	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Read “At a Glance” <i>TG p. 102-103</i> <input type="checkbox"/> Read “Background for the Teacher” <i>TG p. 104-105</i> <input type="checkbox"/> Read “Teaching Children About Spinners” <i>TG p. 106-107</i> <input type="checkbox"/> Watch Video demo of Inv. 3, Pt 1 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 108-110</i>	Guiding the Investigation <input type="checkbox"/> “Part 1: Tops” Steps 1-7 <i>TG p. 111-112</i>		Guiding the Investigation <input type="checkbox"/> “Part 1: Tops; Wrapping up Pt 1” Steps 8-15 <i>TG p. 112-115</i>		Reading in Science Resources <input type="checkbox"/> Steps 16-18 <i>TG p. 115-116</i>  Student Reading: Science Resources p. 11-15  <input type="checkbox"/> <b>Body of Evidence Prompt #4</b> <i>TG p.217</i>
Day 16		Day 17		Day 18	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Watch Video demo of Inv. 3, Pt 2 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 117-119</i>	Guiding the Investigation <input type="checkbox"/> “Part 2: Zoomers; Wrapping up Pt 2” Steps 1-9 <i>TG p. 120-122</i>	<input type="checkbox"/> Watch Video demo of Inv. 3, Pt 3 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 123-125</i>	Guiding the Investigation <input type="checkbox"/> “Part 3: Twirlers” Steps 1-10 <i>TG p. 126-128</i>		Guiding the Investigation <input type="checkbox"/> “Part 3: Twirlers; Wrapping up Pt 3” Steps 11-15 <i>TG p. 128-129</i>

**Pacing Guide – Investigation 3: Spinners (continued)**

Day 19		Day 20	
Prep	Instruction	Prep	Instruction
	Reading in Science Resources <input type="checkbox"/> Steps 16-18 <i>TG p. 130</i>  Student Reading: Science Resources p. 16-20		<input type="checkbox"/> Review <input type="checkbox"/> Interdisciplinary Extensions <i>TG p. 131-134</i>



**Grade 2 – Balance and Motion**  
**Pacing Guide – Investigation 4: Rollers**



**Investigation Overview**

**Investigation 4: Rollers**

**Concept: The motion of objects and be observed and measured.**

Students investigate rolling objects— wheels, cups, and spheres—and describe change in position over time. They gain more experience with gravity causing objects to fall to the ground. Students use flexible marble runways to observe an object’s change of position.

<b>Part 1: Rolling Wheels</b>	<b>Part 2: Rolling Cups</b>	<b>Part 3: Rolling Spheres</b>
<p><u>Summary</u> Students set up cardboard ramps down which they roll plastic disks. They put the disks on slim shafts to make wheel-and-axle systems. They try all kinds of configurations of wheel size, axle length, and axle position to the rolling systems to perform a variety of tricks. Students observe the wheel-and –axle systems move and describe the change of position.</p>	<p><u>Summary</u> Students roll cups down ramps. They observe the way cups roll and use the predictable curving rolling path to meet challenges. They put together to make them roll straight and weight them in various ways to see how weight affects rolling. Students observe the motion and describe the change of position of the cups. Students read about rolling objects and discuss the difference between rolling and spinning.</p>	<p><u>Summary</u> Students roll marbles in cups and down runways to observe spheres as rollers. They work with the flexible runways to make the rolling marbles do tricks using the force of gravity. As a culminating experience, students work together as a class to connect the runway sections to make one long runway through which a marble can roll nonstop.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Wheels roll down a slope because of gravity.</li> <li>▪ A slope is a surface that is higher on one end.</li> <li>▪ Axles support wheels.</li> <li>▪ Wheel-and-axle systems with wheels of different sizes roll toward the smaller wheel.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Cups roll in the direction of the smaller end.</li> <li>▪ To roll straight, two cups can be taped together so the ends are the same size.</li> <li>▪ The amount and location of an added weight can change the way a system rolls.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Spheres are around in all directions and roll in all directions</li> <li>▪ A runway must be higher at the start and low at the finish for a sphere to roll the complete length.</li> <li>▪ Spheres roll down a slope because of gravity</li> </ul>
<p><u>Time Allocation</u> Active Investigation/Wrap-Up: 1 day</p>	<p><u>Time Allocation</u> Active Investigation/Wrap-Up: 1 day Reading: 1 day</p>	<p><u>Time Allocation</u> Active Investigation/Wrap-Up: 2 days Review: 1 day</p>
<p><u>CA Science Standards</u> PS1a, PS1b, PS1c, PS1e, I&amp;E5a</p>	<p><u>CA Science Standards</u> PS1a, PS1b, PS1c, PS1e, I&amp;E5a</p>	<p><u>CA Science Standards</u> PS1a, PS1b, I&amp;E5a, I&amp;E5b</p>



**Grade 2 – Balance and Motion**  
**Pacing Guide – Investigation 4: Rollers**



**Pacing Guide – Investigation 4: Rollers**

Day 21		Day 22		Day 23	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Read “At a Glance” <i>TG p. 136-137</i> <input type="checkbox"/> Read “Background for the Teacher” <i>TG p. 138</i> <input type="checkbox"/> Read “Teaching Children About Rollers” <i>TG p. 139</i> <input type="checkbox"/> Watch Video demo of Inv. 4, Pt 1 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 140-142</i>	Guiding the Investigation <input type="checkbox"/> “Part 1: Rolling Wheels; Wrapping up Part 1” Steps 1-15 <i>TG p. 143-146</i>	<input type="checkbox"/> Watch Video demo of Inv. 4, Pt 2 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 147-148</i>	Guiding the Investigation <input type="checkbox"/> “Part 2: Rolling Cups; Wrapping up Part 2” Steps 1-15 <i>TG p. 149-152</i>		Reading in Science Resources <input type="checkbox"/> Steps 16-18 <i>TG p. 153</i>  Student Reading: Science Resources p. 21-27  <input type="checkbox"/> <b>Body of Evidence Prompt #5</b> <i>TG p.219</i>
Day 24		Day 25		Day 26	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Watch Video demo of Inv. 4, Pt 3 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 154-155</i>	Guiding the Investigation <input type="checkbox"/> “Part 3: Rolling Spheres” Steps 1-8 <i>TG p. 156-158</i>		Guiding the Investigation <input type="checkbox"/> “Part 3: Rolling Spheres; Wrapping up Part 3” Steps 9-15 <i>TG p. 156-160</i>		<input type="checkbox"/> Review <input type="checkbox"/> Interdisciplinary Extensions <i>TG p. 161-164</i>



**Grade 2 – Balance and Motion**  
**Pacing Guide – Investigation 5: Back and Forth**



**Investigation Overview**

<p><b>Investigation 5: Back and Forth</b>  <b>Concept: A vibrating object is a source of sound and the length of that object determines the pitch.</b>          Students explore the production of sound with a door fiddle, tuning forks, xylophones, kalimbas, spoons, and gongs. Students look for vibrations at the sound source and explore how to change pitch and volume of sound.</p>	
<p><b>Part 1: Sound and Vibrations</b></p>	<p><b>Part 2: Length and Pitch</b></p>
<p><u>Summary</u>          Students use cups with rubber bands and flat sticks to make sound. They focus on the source of the sound and find that it is a moving back and forth rapidly. Students then investigate other systems, spoons gongs, tuning forks, and a door fiddle. They find that sounds always come from objects that are vibrating, and that vibrating objects always make sound. Sound can be stopped by stopping the object's vibrating.</p>	<p><u>Summary</u>          Students roll cups down ramps. They observe the way cups roll and use the predictable curving rolling path to meet challenges. They put together to make them roll straight and weight them in various ways to see how weight affects rolling. Students observe the motion and describe the change of position of the cups. Students read about rolling objects and discuss the difference between rolling and spinning.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Fast back-and-forth motion is vibration.</li> <li>▪ Vibrating objects make sound; sound comes from vibrating objects.</li> <li>▪ Objects stop making sound when the stop vibrating.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Sound has pitch, a quality of being high or low.</li> <li>▪ Sound has volume, a quality of being loud or soft.</li> <li>▪ High-pitched sounds come from objects that vibrate fast; low-pitched sounds come from objects that vibrate slowly.</li> <li>▪ Large objects vibrate slowly and produce low-pitched sounds; smaller objects vibrate quickly and produce high-pitched sounds.</li> </ul>
<p><u>Time Allocation</u>          Active Investigation/Wrap-Up: 1 day</p>	<p><u>Time Allocation</u>          Active Investigation/Wrap-Up: 1 day          Reading: 1 day          Review: 1 day</p>
<p><u>CA Science Standards</u>          PS1g</p>	<p><u>CA Science Standards</u>          PS1g, I&amp;E4a, I&amp;E4g</p>



**Grade 2 – Balance and Motion**  
**Pacing Guide – Investigation 5: Back and Forth**

**Pacing Guide – Investigation 5: Back and Forth**

Day 27		Day 28		Day 29	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Read “At a Glance” <i>TG p. 166-167</i> <input type="checkbox"/> Read “Background for the Teacher” <i>TG p. 168-169</i> <input type="checkbox"/> Read “Teaching Children About Vibrations” <i>TG p. 170</i> <input type="checkbox"/> Watch Video demo of Inv. 5, Pt 1 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 171-175</i>	Guiding the Investigation <input type="checkbox"/> “Part 1: Back and Forth; Wrapping up Part 1” Steps 1-13 <i>TG p. 176-181</i>	<input type="checkbox"/> Watch Video demo of Inv. 5, Pt 2 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 182-184</i>	Guiding the Investigation <input type="checkbox"/> “Part 2: Length and Pitch; Wrapping up Part 2” Steps 1-15 <i>TG p. 185-189</i>  <input type="checkbox"/> <b>Body of Evidence Prompt #6</b> <i>TG p.221</i>		Reading in Science Resources <input type="checkbox"/> Steps 16-18 <i>TG p. 190</i>  Student Reading: Science Resources p. 28-32
Day 30					
Prep	Instruction				
	<input type="checkbox"/> Review <input type="checkbox"/> Interdisciplinary Extensions <i>TG p. 191-192</i>				



**Grade 2 – Balance and Motion**  
**Pacing Guide – Investigation 6: Magnets and Tools**



**Investigation Overview**

<p><b>Investigation 6: Magnets and Tools</b>  <b>Concept: Magnets have forces that attract and repel through space and most materials.</b>          Students work with magnets and find that two magnets will either attract or repel one another, depending on their orientation (force at a distance). They read about and view a video on how tools and machines make things move.</p>	
<p><b>Part 1: Magnets</b></p>	<p><b>Part 2: Tools and Machines</b></p>
<p><u>Summary</u>          Students work with permanent magnets. They bring magnets close to different kinds of materials, finding that only steel paper clips are pulled toward the magnet. They bring two magnets close to one another and find that sometimes they pull each other and sometimes the push each other. They recognize the magnetic force can make force acts at a distance. Magnets don't need to touch to initiate movement. Students read about how the magnetic force can move objects at a distance.</p>	<p><u>Summary</u>          Students share their knowledge of tools and machines in their everyday lives. They watch a video that shows how many different kinds of machines are at work around us, making work easier. Students see how simple machines and complex machines help people move heavy objects. Students read about how tools and machines apply forces to make things move.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Magnets push and pull other magnets.</li> <li>▪ Magnets pull steel objects.</li> <li>▪ Magnetic force acts at a distance to make objects move.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Machines are used to apply force to move objects.</li> <li>▪ Tools are used to apply force to move objects.</li> <li>▪ Tools and machines are used by humans to make work easier.</li> </ul>
<p><u>Time Allocation</u>          Active Investigation/Wrap-Up: 1 day          Reading: 1 day</p>	<p><u>Time Allocation</u>          Active Investigation/Wrap-Up: 1 day          Reading: 1 day          Assessment: 1 day</p>
<p><u>CA Science Standards</u>          PS1f, I&amp;E4a, I&amp;E4g</p>	<p><u>CA Science Standards</u>          PS1d</p>



**Grade 2 – Balance and Motion**  
**Pacing Guide – Investigation 6: Magnets and Tools**



**Pacing Guide – Investigation 6: Magnets and Tools**

Day 31		Day 32		Day 33	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Read “At a Glance” <i>TG p. 194-195</i> <input type="checkbox"/> Read “Background for the Teacher” <i>TG p. 196-197</i> <input type="checkbox"/> Read “Teaching Children About Vibrations” <i>TG p. 198</i> <input type="checkbox"/> Watch Video demo of Inv. 6, Pt 1 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 199-200</i>	Guiding the Investigation <input type="checkbox"/> “Part 1: Magnets; Wrapping up Pt 1” Steps 1-11 <i>TG p. 201-205</i>		Reading in Science Resources <input type="checkbox"/> Steps 12-14 <i>TG p. 206</i>  Student Reading: Science Resources p. 33-37  <input type="checkbox"/> <b>Body of Evidence Prompt #7</b> <i>TG p.224</i>	<input type="checkbox"/> Watch Video demo of Inv. 6, Pt 2 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 207-208</i>	Guiding the Investigation <input type="checkbox"/> “Part 2: Tools and Machines; Wrapping up Pt 2” Steps 1-5 <i>TG p. 210</i>
Day 34		Day 35			
Prep	Instruction	Prep	Instruction		
	Reading in Science Resources <input type="checkbox"/> Steps 6-9 <i>TG p. 211</i> Student Reading: Science Resources p. 38-42 <input type="checkbox"/> <b>Body of Evidence Prompt #8</b> <i>TG p.225</i>		Assess Progress Administer End-Of-Module Assessment <input type="checkbox"/> Step 10 <i>TG p. 211</i>		



## Grade 2 – Balance and Motion Recommended Body of Evidence



### Overview

This guide is intended to support the collection of a Body of Evidence. A student's Body of Evidence should, at a minimum, include work from the listed prompts and in-class investigations. Other class work and assessments that demonstrate a student's level of proficiency may be included.

Download samples of proficient work @ <https://eteams.sandi.net/sites/sbrc>

Note: Administer Grade 2 FOSS Physical Science End-of-Module assessment (can also be used as a pre-assessment at the beginning of the unit).

### Recommended Body of Evidence – Grade 2 Physical Science

#### Concept #1

The motion of objects can be observed and measured.  
(CA Standards PS1a, PS1b, PS1c, PS1d, PS1e, PS1f, PS1g)

**Prompt #1: (I&E) FOSS: Balance and Motion Investigation 1: The First Straw Part 2: Estimating and Measuring**  
(TG p. 213 – How Long Is It? – No. 1 – Science Notebook)

Object - Estimated length - Measured length - Estimate compared to actual

**Prompt #2: (I&E) FOSS: Balance and Motion Investigation 1: The First Straw Part 3: Making Comparisons**  
(TG p. 214 – Making Comparisons – No. 2 – Science Notebook)

Use your meter tape to find out which is longer. Estimate Measurement

**Prompt #3: (I&E) FOSS: Balance and Motion Investigation 2: Balance Part 3: The Pencil Trick**  
(TG p. 216 – Make It Balance! Review – No. 4 – Science Notebook)

1. Think of balancing on one foot. What can you do with your body to help you balance? 2. Is it easier to balance a ball or a book on your head? Why?  
3. What does balance mean? 4. What does counterbalance mean?

**Prompt #4: (I&E) FOSS Balance and Motion Investigation 3: Spinners Part 1: Tops**  
(TG p.217– Push or Pull? Review – No. 5 – Science Notebook)

1. What two ways can a force make things move? 2. Tell about one way you can move a ball. Is the force a push or a pull? 3. Tell how to spin a pinwheel, and describe the force.

**Prompt #5: (I&E) FOSS: Balance and Motion Investigation 4: Rollers Part 2: Rolling Cups**  
(TG p. 219 Rolling, Rolling, Rolling! Review – No. 7 – Science Notebook)

1. Name four things that roll. 2. Describe what happens to tennis ball when it rolls on the floor. 3. Why can't a block roll down a ramp? 4. What is the difference between rolling and spinning?

**Recommended Body of Evidence – Grade 2 Physical Science (continued)**

**Prompt #6: FOSS: Balance and Motion Investigation 5: Back and Forth Part 2: Length and Pitch**

**(TG p. 221 – The Xylophone – No. 9 – Science Notebook)**

Was the student's drawing right? How would you draw the xylophone tubes? Short xylophone tubes make \_\_\_\_\_ pitched sounds. Long xylophone tubes make \_\_\_\_\_ pitched sounds.

**Prompt #7: FOSS: Balance and Motion Investigation 6: Magnets and Tools Part 1: Magnets**

**(TG p. 224 – Move It, But Don't Touch It Review – No. 12 – Science Notebooks)**

1. Think of a paper clip on a tabletop. Tell about three ways to move it. 2. What is a way to move the paper clip without touching it? 3. Name some things that magnets move. 4. Is magnetism a force? Why?

**Prompt #8: (I&E) FOSS: Balance and Motion Investigation 6: Magnets and Tools Part 2: Tools and Machines**

**(TG p. 225 – Tools and Machines Review – No. 13 – Science Notebook)**

1. Name some tools that help people do work. 2. What kind of work can do with a hammer and nail? 3. Name some machines that help people do work. 4. What type of force will remove a nail from wood?



**Grade 2 – Balance and Motion  
Module Materials and Equipment**



**Materials Provided**

The FOSS kit comes with most of the supplies that are needed to teach the unit. The kits will be delivered to the school site prior to the start of the 12-week unit of instruction. At the end of the 12-weeks, the kit will be returned to the Science Resource Center where it will be refurbished and prepared for its next use. Please review the refurbishment calendar for kit drop-off and return dates. Kits must be returned according to the refurbishment calendar to ensure that all kits are checked and restocked with consumable materials.

**Materials Supplied by the Teacher or School Site**

Be aware that the classroom teacher or school site must supply a few items. These are indicated in the materials list for each part of the investigation with an asterisk (\*). Here is a summary of those items.

<p><b>Investigation 1: The First Straw</b></p> <ul style="list-style-type: none"> <li>▪ Crayons</li> <li>▪ Marking pens, different colors</li> <li>▪ Flip Chart or chart paper</li> <li>▪ Scissors</li> </ul>	<p><b>Investigation 2: Balance</b></p> <ul style="list-style-type: none"> <li>▪ Cardboard</li> <li>▪ Clothesline</li> <li>▪ Index Cards (optional)</li> <li>▪ 32 Pencils</li> <li>▪ Overhead projector (optional)</li> <li>▪ Pliers (optional)</li> <li>▪ Scissors</li> <li>▪ Transparency (optional)</li> </ul>	<p><b>Investigation 3: Spinners</b></p> <ul style="list-style-type: none"> <li>▪ Card stock (optional)</li> <li>▪ Chart Paper</li> <li>▪ Crayons or markers</li> <li>▪ Felt tipped pens</li> <li>▪ Jump Rope or other rope</li> <li>▪ Paper</li> <li>▪ Scissors</li> </ul>
<p><b>Investigation 4: Rollers</b></p> <ul style="list-style-type: none"> <li>▪ 50 Pennies</li> </ul>	<p><b>Investigation 5: Back and Forth</b></p> <ul style="list-style-type: none"> <li>▪ 1 Musical Instrument (optional)</li> <li>▪ Paper towels</li> <li>▪ Pencil</li> <li>▪ Scissors</li> </ul>	<p><b>Investigation 6: Magnets and Tools</b></p> <ul style="list-style-type: none"> <li>▪ Chair with steel legs</li> <li>▪ VCR and Monitor</li> </ul>