



PLANNED COURSE OF STUDY

Course Title	Science
Grade Level	Second
Length of Course	One school year
Author(s)	Robin Cottone

Course Description:

Second grade science includes physical, earth, and biological sciences. Students will use the habits and techniques of a true scientist by observation and discovery. Students engage in engineering practices to collect data to answer questions, and to define problems in order to develop solutions. Students explore the natural world by using simple instruments and calendars to observe and monitor change. Students will observe the development and growth over time of animals and plants.

Course Rationale:

Learning about air and weather, motion and matter, and life cycles, guides students further into understanding the world they live in, and the forces of nature constantly around them. Student centered learning allows the child to ask questions and actively seek an answer; which is the basis for science and methods of scientists. When students construct their knowledge, it becomes meaningful and may be remembered long term.



Curriculum Map (Year Long Course)

Month	Typical # of Weeks	Topics Covered this Month
September	4 weeks	Air and Weather
October	4 weeks	Air and Weather
November	3 weeks	Social Studies during this time
December	3 weeks	Social Studies during this time
January	4 weeks	Social Studies during this time
February	4 weeks	Social Studies during this time
March	4 weeks	Motion and Matter
April	3 weeks	Motion and Matter
May	4 weeks	Life Cycles
June	2 weeks	Life Cycles



Unit Title	Air and Weather
Unit Description	Students engage in science and engineering practices by collecting data and designing and using tools to answer questions about air and weather.
Essential Questions &	What can air do? How does a parachute interact with air? What happens when air is pushed into a smaller space? How can water be used to show that air takes up space? What is the weather today? What time of day is the air the warmest? What types of clouds are in the sky today? What time of day can we observe the Moon? How can bubbles be used to observe the wind? How can pinwheels be used to observe the wind? What does a wind vane tell us about the wind? How can we describe the weather over a month? What does the Moon look like at different times during a month? How does the amount of daylight change over the year? How does the temperature and weather change over the seasons?
Enduring Understandings	<ul style="list-style-type: none">• Air is a gas and is all around us.• Air is matter and takes up space.• Air makes objects move.• Air moves from place to place. Moving air is wind.• Air resistance affects how things move.• Air can be compressed.• The pressure from compressed air can move things, including water.• Weather describes conditions in the air outside.• Temperature describes how hot or cold the air is. Temperature is measured with a thermometer.• Clouds are made of liquid water drops that fall to Earth as rain. Wind moves clouds in the sky.• The Sun and Moon can be observed moving across the sky; we see them at different locations in the sky, depending on the time of day or night.• Wind is moving air.



	<ul style="list-style-type: none"> • Meteorologists use wind scales (models) to describe the strength of the wind • Meteorologists use anemometers to measure the speed of the wind. • A wind vane points in the direction the wind is coming from. • Wind lifts kites up into the sky • Daily changes in temperature and weather type can be observed, compared, and predicted over a month. • The Sun and Moon can be observed moving across the sky; we see them at different locations in the sky, depending on the time of day or night. • Each season has a typical weather pattern that can be observed, compared, and predicted. The number of hours of daylight changes predictably through the seasons.
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PA Academic Standards	Assessment Anchors
3.3.1.A.5	S4.A.3.3
3.3.2.A.7	S4.D.2.1
3.3.2.B.1	S4.D.3.1
3.3.2.B.3	

Key Unit Vocabulary	<p>Investigation 1: <i>air, air resistance, barrel, blow, bubble, compress, distance, engineer, gas, matter, move, parachute, plunger, pressure, push, rocket, submerge, syringe, system, tube, wind</i></p> <p>Investigation 2: <i>change, cirrus, cloud, cold, cool, cumulus, day, degrees Celsius, degrees Fahrenheit, describe, hot, measure, meteorologist, moon, night, overcast, partly cloudy, pattern, rain gauge, rain record, snowy, star, stratus, sun, sunny, sunrise, sunset, symbol, temperature, thermometer, warm, water vapor, weather, weather condition, weather instrument</i></p> <p>Investigation 3: <i>anemometer, calm, direction, east, gentle breeze, kite, moderate breeze, north, pinwheel, south, strong breeze, west, wind speed, wind vane</i></p> <p>Investigation 4: <i>fall, graph, hibernate, migrate, season, spring, summer, winter</i></p>
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Learning Objectives - <i>The student will...</i>	Assessment Opportunities
<p>Investigation 1</p> <ul style="list-style-type: none">● Explore properties of a common gas mixture—air.● Use vials, syringes, and tubing, students experience air as matter, discovering that it takes up space and can be compressed, and that compressed air builds up pressure that can push objects around. Students will construct and compare parachutes and balloon rockets that use air.	<p>Embedded Assessment Science notebook entries Performance assessment</p> <p>Benchmark Assessment Investigation 1 I-Check</p>
<p>Investigation 2</p> <ul style="list-style-type: none">● Use instruments for 4–8 weeks to observe and record weather on a class calendar and in science notebooks.● Monitor temperature with a thermometer and (optionally) rainfall with a rain gauge.● Identify three basic cloud types by matching their observations with a cloud chart.● Monitor times of sunrise and sunset and record the number of daylight hours each day.	<p>Embedded Assessment Science notebook entries Performance assessment</p> <p>Benchmark Assessment Investigation 2 I-Check</p>
<p>Investigation 3</p> <ul style="list-style-type: none">● Look for evidence of moving air.● Observe and describe wind speed using pinwheels, an anemometer, and a wind scale.● Observe bubbles and construct wind vanes to find the wind's direction. Students will fly kites to feel the strength of the wind and the direction it is moving.	<p>Embedded Assessment Science notebook entries Performance assessment</p> <p>Benchmark Assessment Investigation 3 I-Check</p>



<p>Investigation 4</p> <ul style="list-style-type: none"> ● Organize monthly weather data, using graphs to describe weather trends. ● Monitor weather throughout the year, comparing the seasons and looking for weather patterns. ● Use the observations they have recorded on the calendar to look for monthly patterns of the Moon and annual patterns of daylight hours. 	<p>Embedded Assessment Science notebook entries Performance assessment</p> <p>Benchmark Assessment Investigation 4 I-Check</p>
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Sequence of Teaching and Learning		
Number of Lessons / Blocks	Lesson Topic	Lesson Activities
8 lessons	Exploring Air	<p>1.1 Air is There Students work with a set of objects to see how objects can be moved by and through air.</p> <p>1.2 Parachutes Students construct and observe parachutes dropping through air. They think about how air slows the descent of the parachute. They design and test a parachute to land a cargo container gently without spilling the contents.</p> <p>1.3 Pushing on Air Students use syringes to investigate air. They discover that air can be compressed and that air under pressure can push objects around.</p> <p>1.4 Air and Water Students put together tubes, a bottle, water, a rubber stopper, and two syringes to create a system. They add water and use air pressure to push the water around the system.</p> <p>1.5 Balloon Rockets Students set up a balloon-rocket system and find out how far the air in the balloon will propel the system along a flight line.</p>
8 Lessons	Observing the Sky	<p>2.1 Weather Calendars Students share what they know about weather and how it relates to air. Rotating class meteorologists begin recording daily weather observations on a class calendar. Students use</p>



		<p>symbols to indicate five basic types of weather</p> <p>2.2 Measuring Temperature and Daylight Students learn to use a thermometer and take turns measuring and recording the temperature. They construct a model thermometer and practice reading various temperatures. They monitor sunrise and sunset and record the total number of daylight hours each day. They collect data on temperature changes during the day.</p> <p>2.3 Watching Clouds Students observe and compare several types of clouds and discuss how they move across the sky. The class discusses the kinds of clouds that bring rain and snow. Students can use a rain gauge to measure rain or snowfall.</p> <p>2.4 Observing the Moon Students discuss their observations of the day and night sky, and begin to make systematic observations of the moon. The observations will continue during the daytime and nighttime for 4 weeks.</p>
8 lessons	Wind Explorations	<p>3.1 Bubbles in the Wind Students use bubble wands to blow bubbles outdoors. They investigate how air moves bubbles in a variety of locations around the school building.</p> <p>3.2 Wind Speed Students go outdoors to feel and observe the wind. They are introduced to descriptive wind scale and an anemometer, an instrument used to measure wind speed.</p> <p>3.3 Pinwheels Students construct a pinwheel and observe how it operates when they blow on it, move it through air, and take it outdoors in the wind. They compare the action of the pinwheels to the class anemometer.</p> <p>3.4 Wind Vanes Students learn about wind vanes, instruments used to indicate wind directions. Students compare the movement of the wind vanes to that of bubbles and clouds.</p> <p>3.5 Kites Students construct kites. They use the anemometer and wind vane to determine the best location and direction for flying kites.</p>



8 lessons	Looking for Change	<p>4.1 Changes over a Month Students organize and graph the class weather data recorded over a period of weeks. The class can continue recording the weather on the calendar and then graph the following month. Students also revisit the Moon calendar and look for patterns over the month.</p> <p>4.2 Daylight through the Year The class looks at the amount of daylight on the same day of each month over the year. Students describe the pattern they observe and predict the number of hours of daylight on their birthday that year. They compare the actual hours to their predicted number of hours.</p> <p>4.3 Comparing the Seasons The class moves from recording weather data on a calendar to creating seasonal graphs of the weather and temperature. Each season, the class creates new graphs and compares them with graphs from the preceding seasons.</p>
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Resources for this Unit

"Air and Weather." *Delta Education*. Delta Education, n.d. Web. 23 Mar. 2017



Unit Title	Embryology/Life Cycles
Unit Description	As a living thing grows and develops it goes through a series of changes. When living organisms dies, new ones replace them. This ensures the survival of the species. During its life cycle, an organism goes through physical changes that allow it to reach adulthood and produce new organisms. The Life Cycles unit addresses the life cycles of plants and animals, including humans.
Essential Questions & Enduring Understandings	<p>How is an incubator used?</p> <ul style="list-style-type: none"> ● The role of temperature, humidity, and position of eggs <p>How does a living thing grow and change? What are the characteristics of living, non-living things?</p> <ul style="list-style-type: none"> ● Organisms have basic needs: Living things need water, air, nutrients, and light. ● Organisms can survive only in environments in which their needs can be met. ● Living things can be grouped based on their similarities and differences. ● Each animal has different structures that serve different functions in growth, survival, and reproduction ● The availability of nutrients, light, and water influences the growth and behavior of living things. ● The behavior of organisms is influenced by internal cues (such as hunger) and by external cues (such as change in the environment). ● Each animal goes through a series of growth and development. The length of time from beginning of development to death of an animal is called its life span. ● The details of the life cycle are different for different organisms. ● Animals resemble their parents.

PA Academic Standards	Assessment Anchors
3.1.3.A1	S4.B.1.1.1
3.1.3.A2	S4.B.1.1.3
3.1.3.A3	S4.B.1.1.5



3.1.4.A5 3.1.3.B1 3.1.4.B1 3.1.4.B2 3.1.3.B5 3.1.3.C2 3.2.2.B6	S4.B.2.2
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Key Unit Vocabulary	<i>adolescence, adulthood, brooder box, caterpillar, chick, chicken, childhood, chrysalis, egg, environment, fertilized, frog, froglet, habitat, hatch, hatchling, incubator, infancy, life cycle, metamorphosis, nutrients, plant, pupa, root, seed, seedling, sprout, tadpole</i>
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Learning Objectives – <i>The student will...</i>	Assessment Opportunities
Embryology -hatching chicks <ul style="list-style-type: none"> ● Compare and contrast living and non-living things. ● Research in non-fiction literature. ● Locate essential information. ● Ask and answer questions ● Organize life cycle chart ● Work together in cooperative groups. ● Handle chicks carefully ● Participate in care of eggs and chicks. ● Observe interaction of eggs and chicks with their surroundings ● Observe chicks hatching from eggs ● Observe and describe changes of structure and behavior of growing chicks ● Communicate observations ● Acquire the vocabulary associated with the structure and behavior of chicks. 	Life Cycle journal entries



<p>Plant life cycle</p> <ul style="list-style-type: none"> ● plant marigold seeds ● provide soil, water, and sunlight ● communicate observations ● measure growth and change through time 	<p>Life Cycle journal entries</p>
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Sequence of Teaching and Learning		
Number of Lessons / Blocks	Lesson Topic	Lesson Activities
1 day	Living Things vs. Non-Living Things	Students sort materials into groups based on their common characteristics.
1 day to prepare incubator 7 days of turning eggs and observation	What is an incubator and how is it used?	<ul style="list-style-type: none"> ● Help prepare an incubator. ● Place incubator out of drafts. ● Put in thermometer, water and eggs. ● Use an incubator. ● Read a thermometer. ● Turn eggs three times a day from Day 14 to Day 21. ● Look at eggs daily ● observe hatching
1 day	Planting seeds	Students plant marigold seeds using nutrient rich soil, water the seed and place seeds in a sunny spot on the window sill.
30 days of observation	Observe seed growth	Students observe germination and growth. They monitor and record changes in the plant over time. Students research/read nonfiction text to supplement their understanding of what plants need, and the plant's different stages of development.
1 Day	Brooder Box	Prepare the brooder box for the newly hatched chicks. Students brainstorm what it should include. Watch video clips of an actual brooder box.
1 day	Plant Life Cycle	Students harvest seeds from the adult plant to gain understanding of the life cycle of plants.
4 days	Chick growth	Students observe and document growth and changes of chick in the initial 4-5 days of life.



Unit Title	Balance and Motion
Unit Description	In the Balance and Motion unit, students will develop an interest in the balance and motion of objects. Students will investigate materials in a constructive way that will enhance understanding that everything in our world is in some kind of motion and has a balance system.
Essential Questions & Enduring Understandings	<p>How many ways can a shape be balanced?</p> <ul style="list-style-type: none">● Objects can be balanced in many ways● Counterweights can help balance an object.● The way an object balances can be changed by counterweighting <p>How can counterweights help us balance shapes?</p> <p>How can a pencil be balanced on its point?</p> <ul style="list-style-type: none">● A stable position is one that is steady; the object is 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. <p>How do the parts of a mobile stay in stable positions?</p> <ul style="list-style-type: none">● A mobile is a system of balanced beams and objects. <p>How can spinning tops be changed?</p> <ul style="list-style-type: none">● Objects and systems that turn on a central axis exhibit rotational motion.● You need a force to start a top spinning.● The amount and position of mass affect how the object rotates. <p>How can a spinning object be kept in motion?</p> <ul style="list-style-type: none">● There are different ways to initiate rotational motion.● The motion of an object can be changed by pushing or pulling.● Tops and zoomers both spin, but in different ways. <p>How can air start an object spinning?</p> <ul style="list-style-type: none">● Variations in design can influence the rotational motion of spinning objects.● Air resistance can act as the force that initiates rotational motion. <p>How can a wheel and axle system be changed?</p> <ul style="list-style-type: none">● Wheels roll down a slope



	<ul style="list-style-type: none"> ● A slope is a surface that is higher on one end. ● Axles support wheels. ● Wheel and axle systems with wheels of different sizes roll toward the smaller wheel. <p>Can we predict the behavior of a rolling cup? What happens if weight is added to a rolling cup system?</p> <ul style="list-style-type: none"> ● Cups roll in the direction of the smaller end. ● To roll straight, two cup[s] can be taped together so the ends are the same size. ● The amount and location of an added weight can change the way a system rolls. <p>How can we make a runway system that will keep a marble rolling?</p> <ul style="list-style-type: none"> ● Spheres are round in all directions and roll in all directions. ● A runway must be high at the start and low at the finish for the sphere to roll the complete length. ● Spheres roll down a slope.
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PA Academic Standards	Assessment Anchors
3.1.2.A9 3.1.2.B6 3.1.2.C4 3.2.2.A6 3.2.1.B1 3.2.3.B1 3.2.2.B7 3.2.4.B	S4.C.1.1 S4.C.3.1

Key Unit Vocabulary	<i>air resistance, arch, axis, axle, balance, balance point, balanced, clothespin, counterbalance, counterweight, crayfish, disk, force, gravity, knot, loop, mobile, motion, object, pitch, position, ramp, roll, rotate, runway, shaft, slope, sphere, spin, spiral, stable, stable position, swirl, system, top, triangle, twirl, twirler, twist, unstable, vibration, volume, weight, wheel, whirl, wing, wire, zoomer</i>
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Learning Objectives - <i>The student will...</i>	Assessment Opportunities
<p>Investigation 1: In Balance, students will</p> <ul style="list-style-type: none">● Discover numerous ways to balance tagboard (two-dimensional) shapes.● Find ways to balance a pencil on its point, in stable positions.● Explore the concepts of balance, counterbalance, counterweight, and stability by balancing tagboard shapes, making mobiles, and engaging on other balancing projects.● Communicate observations and comparisons of balanced objects, using precise vocabulary.	<p>Anecdotal Notes Teacher Observation Student worksheets</p>
<p>Investigation 2: In Spinners, students will...</p> <ul style="list-style-type: none">● Construct toys that demonstrate spinning.● Discover different ways to produce rotational motion.● Explore variables that influence the spinning of tops, zoomers, and twirlers.	<p>Anecdotal Notes Teacher Observation Student worksheets</p>
<p>Investigation 3: In Rollers, students will...</p> <ul style="list-style-type: none">● Roll objects down slopes.● Observe and compare rolling systems with different-sized wheels.● Observe rolling systems with weight attached to the wheels.● Discover that marbles roll from high places to low places.● Set up runways to get marbles to perform tricks.● Communicate observations and	<p>Anecdotal Notes Teacher Observation Student worksheets</p>



comparisons of rolling motion, using precise vocabulary.	
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Sequence of Teaching and Learning		
Number of Lessons / Blocks	Lesson Topic	Lesson Activities
8	Balance	<p>1.1 Trick Crayfish 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.</p> <p>1.2 Triangle and Arch 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.</p> <p>1.3 The Pencil Trick Students use a piece of soft wire and clothespins to balance a pencil on its point in a stable position.</p> <p>1.4 Mobiles Students make mobiles to confirm developing concepts of balance, counterbalance, and stability.</p>
8	Spinners	<p>2.1 Tops Students make tops from plastic discs and shafts, and spin them. After finding the arrangement of parts that produces the best top, they make tops from other materials.</p> <p>2.2 Zoomers Students use discs and a length of string to make zoomers</p> <p>2.3 Twirlers Students make twirlers (flying spinners) that rotate by air resistance, first modifying soda straw with wings, and then making twirly birds from paper and paper clips.</p>
8	Rollers	<p>3.1 Rolling Wheels Students set up cardboard ramps down which they roll plastic disks. They put the disks on slim shafts to make wheel and</p>



	<p>axle systems. They try all kinds of configurations of wheel size, axle length, and axle position to get the rolling systems to perform a variety of tricks.</p> <p>3.2 Rolling Cups Students roll paper cups down ramps. They observe the way cups roll and use the predictable curved rolling path to meet challenges. They put cups together to make them roll straight and weight them in various ways to see how weight affects rolling.</p> <p>3.3 Rolling Spheres 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. As a culminating experience, students work together as a class to connect the runway section to make one long runway through which a marble can roll nonstop.</p>
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Resources in this Unit

Balance and Motion. 2nd. ed. Nashua, N.H. 03063-4067: Published and Distributed by Delta Education, 2007. Print.