LAKEWOOD CITY SCHOOL DISTRICT STANDARDS-BASED SCIENCE CURRICULUM
THIRD GRADE

GRADE BAND THEME
INTERCONNECTIONS WITHIN SYSTEMS – This theme focuses on helping students recognize the components of various systems and then investigate dynamic and sustainable relationships within systems using scientific inquiry.

Units: 1. Earth's Resources 2. Matter 3. Life Cycles/Adaptations of Plants and Animals.
NOTE: The animal unit was placed in the spring to align with the reading and writing animal research units.

Unit length: 12 weeks each if taught alongside SS or 6 weeks each if alternated by unit with SS

THIRD GRADE
SCIENCE INQUIRY AND APPLICATION (SIA) – These scientific process skills should be integrated into the following grade level content units.

Bolded and starred statements come directly from the standards. Bulleted statements are clarifications for teachers from the ODE Model Curriculum.

Science Inquiry and Application	Resources from 2017-18 Update	Resources linked from LKWD 2012 Course of Study
Science Inquiry and Application During the years of PreK-4, all students must become proficient in the use of the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas: ✶ Observe and ask questions about the natural environment; ✶ Plan and conduct simple investigations; ✶ Employ simple equipment and tools to gather data and extend the senses; ✶ Use appropriate mathematics with data to construct reasonable explanations; ✶ Communicate about observations, investigations and explanations; and ✶ Review and ask questions about the observations and explanations of others.	Current guidance is to teach Science Inquiry and Application through the units described below, rather than as a stand-alone unit.	

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THIRD GRADE
EARTH'S RESOURCES
Earth and Space Science Strand (ESS)

Content Statements	Content Elaboration and Clarification	Resources from 2017-18 Update	Resources linked from LKWD 2012 Course of Study
Earth and Space Science ✶ **Earth's nonliving resources have specific properties. (3)** ● Soil is composed of pieces of rock, organic material, water and air and has characteristics that can be measured and observed. Rocks have unique characteristics that allow them to be sorted and classified. Rocks form in different ways. Air and water are nonliving resources. ● Note 1: Rock classification is not the focus for this grade level; this is found in grade 6. At this grade,	**Soil and Rocks** ✶ **The properties of air and water are introduced in the early elementary grades, so the focus at the third-grade level is on soil and rocks.** ✶ **Air and water are present within rocks and soil. Air and water also play an important role in the formation of rocks and soil. All are considered non-living resources.** ● Identify rock, soil, air and water as examples of nonliving resources. (V) ● Explain that rocks are composed of one or more minerals; therefore, minerals are also examples of nonliving resources. ● Explain why rocks, minerals, soil, air and water are important non-living natural resources. ✶ **The characteristics of rocks and soil must be studied through sampling, observation and testing. This testing includes the ability of water to pass through samples of rock or soil and the determination of color, texture, composition and moisture level of soil.** ● Weathering is the breakdown of large rock into smaller pieces of rock through natural events (e.g., changes in weather or climate, freeze-thaw cycles, wind, water cycle, root and plant growth, etc.). Demonstrate how these smaller pieces of rock can be broken down into even smaller particles to form soil through further weathering. (Introduced, Taught In-Depth at Fourth Grade) ● Explain how earthworms help to create soil by breaking down organic matter and leaving behind waste, called castings, which are a valuable type of fertilizer. Explain how earthworms increase the amount of air and water in soil when they bring organic matter down from the topsoil and mix it with the subsoil. ● Through observation and measurement, investigate and identify the properties of soil including, but not limited to: ° Ability to Support Plant Growth - Various types of soil support the growth of different types of plants. ° Capacity to Retain Water - Various types of soil absorb water at varying rates and thus have different	**Pacing Guide:** ● First Unit of the Year, 12 Weeks Common Summative Assessments **RESOURCES:** DSM3-Soil Science Kit DSM3 Reader-Soil Science, 8-Pack STC-Rocks and Minerals Teacher's Guide STC-Rocks and Minerals Student Investigations Guide, Third Edition	**Reading A to Z** ● Rocks ● Rock Hunting ● Salt Rocks ● Gems: Treasures from the Earth ● Earth's Water ● The Force of Water ● Land and Water ● Oil: A Messy Resource ● Seven Billion and Counting ● Alternative Fuel Cars ● Deep Trouble: The Gulf Coast Oil Spill ● Energy Sources ● Life at the Pond ● To Drill or Not to Drill ● Where We Get Energy

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the actual characteristics of rocks can be used to sort or compare, rather than formal classification. ● Note 2: Properties of air and water have been addressed in PreK.	capacities for holding water. ° Color - Soil can be found in a variety of colors, such as black, brown, gray, red, yellow or white. The weathered minerals from rocks are responsible for the different colors of soil. ° Texture - Soils have a variety of textures because they contain varying amounts of inorganic materials which have grains (i.e., particles) of different sizes. ● Observe and describe the composition of soil (e.g., small pieces of rock, decomposed pieces of plants and animals, by-products of plants and animals, etc.). ● Examine the composition of soil to identify its components including: ° Air ° Inorganic Materials from Weathered Rock - clay, sand, silt ° Organic Materials - living organisms such as plants or animals, decomposed plants or animals (i.e., humus), nutrients that have come from decomposed plants or animals ° Water ● The primary inorganic materials that compose soil have the following characteristic properties: ° Clay - has very tiny grains, holds water easily ° Sand - has grains that can be seen with the human eye, has large spaces between the grains, does not hold water well because the spaces allow water to leave the grains quickly ° Silt - has grains too small to be seen with the unaided eye, has a texture that is similar to flour ● Plan and build a simple sediment tube that can demonstrate how sand, silt, clay and organic material settle in water. Based on the findings, ask: *Which soil type would create muddy water in a stream? Which soil type would wash away faster/farther? What properties of soil contribute to these observations?* (V) ● Investigate that soils are often found in layers. ● Describe the three main layers of soil including: ° Topsoil - top layer, made up of the smallest grains, has the most humus which makes it the most fertile or richest layer of soil, small animals often live in the top layer (e.g., earthworms, insects, slugs, etc.) ° Subsoil - middle layer under the topsoil, made up of larger grains, has less humus than topsoil, contains small pieces of rock ° Bedrock - bottom layer, made up of solid rock composed of minerals which vary based on different locations all over the world, weathering breaks bedrock down into soil ● Observe examples of soil layering and diagram soil profiles. ● Investigate that soils can vary from place to place. ● Different types of soil exist, such as: ° Clay(ey) - has very tiny grains, holds water easily	A Look at Earth's Rocks-What Are Sedimentary Rocks? (Gareth Stevens) A Look at Earth's Rocks-What Are Metamorphic Rocks? (Gareth Stevens) A Look at Earth's Rocks-What Are Igneous Rocks? (Gareth Stevens) A Look at Earth's Rocks-What Are Minerals? (Gareth Stevens) A Look at Earth's Rocks-What Is the Rock Cycle? (Gareth Stevens) Discovery Links 2-What Is Soil?	

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	° Loamy - has large and small grains, has lots of humus, holds enough water for growing plants and drains well ° Sandy - has grains that can be seen with the human eye, does not hold water as well as other types of soil ° Silty - considered to be among the most fertile of soils, usually composed of minerals (predominantly quartz) and fine organic particles, has more nutrients than sandy soil, has a rather smooth texture and looks like dark sand, easy to work with when moist, holds moisture well yet still offers good drainage ● Make a chart, identification key or a local soil map that can be used to interpret soil composition (i.e., sand, silt, clay, organic material, etc.) and/or compare soil types (based on soil properties). Note: A similar chart or map can be made for the characteristics of rocks. (V) ● Compare and contrast soil characteristics that differ from place to place (e.g., soil found on beaches, at playgrounds, in yards of homes, in different regions of the United States, etc.). ● Plan and implement an investigation to test specific properties of different types of soil, such as ability to absorb (hold) water, matching/designating soil color, the ability for water to pass through the soil, the filtering properties of soil, etc. Note: A similar investigation can be conducted for the characteristics of rocks. (V) ● Design and construct a pond, water garden or a wetland environment in a terrarium. Evaluate different soil types to ensure that the chosen soil is able to hold water and support plant life. Present the explanation of the process and the findings to the class. Use the soil properties investigated to make these determinations. (V) ● Explain why different types of soil exist (e.g., due to different kinds of plant and/or animal remains, chemicals in the soil, weather and/or climate in the area, minerals in the soil, etc.). ● Recognize that soil can have different texture, composition or color depending on the environment in which it formed. (V) ✶ **Measurable and observable characteristics of rocks include size and shape of the particles or grains (if present) within the rock, texture and color.** ● Rocks are naturally-formed solids made up of one or more minerals. Rocks exhibit the properties of the minerals from which they were composed. ● Important Note: Minerals will be taught in-depth at the sixth grade. However, in order to measure and observe the characteristics of rocks, an introduction to the properties of minerals may need to be a logical extension to this unit. ● Examine the properties of minerals including, but not limited to: ° Cleavage		

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	◦ Color ◦ Crystal shape ◦ Fluorescence ◦ Hardness ◦ Luster ◦ Magnetism/reaction to a magnet (i.e., magnetic or non-magnetic) ◦ Reaction with an acid (e.g., vinegar, etc.) ◦ Smell ◦ Streak ◦ Texture (which is often due to crystal structure, crystal size or grain size, etc.) ◦ Transparency ● Differentiate between rocks and minerals including: ◦ Minerals are composed of only one substance, and that substance is the same in all samples of the mineral. ◦ Rocks are aggregates of minerals and they also may contain organic matter. ◦ Rocks reflect the properties of the minerals from which they were composed and the characteristics of the way in which they were formed. ● Investigate and observe that rocks are often found in layers. ● Compare and contrast distinct properties of a variety of rocks (e.g., color, layering, texture, etc.). ● Recall that rocks can be sorted based on characteristics such as grain size (texture), color and patterns. (V) ● Make a dichotomous key to organize different types of rocks by grain size, texture, color or patterns. Graphically represent and clarify the sorted results. (V) ✶ **Age-appropriate tools must be used to test and measure the properties.** ● Age-appropriate tools may include, but are not limited to, hand lenses, magnifying glasses, hand-held microscopes, Mohs Scale of Hardness, streak plates, glass plates or other tools used for making observations of rocks, minerals and/or soil. ✶ **The characteristics of the rock can help determine the environment in which it formed.** ● Earth's three layers are involved in the formation of different types of rocks and minerals. The layers include: ◦ Crust - surface of the earth, solid and thin outside layer that is seen, rocks are solid on the crust ◦ Mantle - thick middle layer, so hot that some of the rocks are nearly melted and they are soft like taffy ◦ Core - even hotter than the mantle, outer part of the core is so hot that it is liquid, inner part of the core is much hotter than the mantle although it is solid		

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	● Diagram and describe the characteristics of the layers of the earth. ● Living things affect the physical characteristics of their regions (e.g., plants roots hold soil in place, beaver shelters and human-built dams alter the flow of water, plants' respiration affects the air, etc.). Many types of rocks and minerals are formed from the remains of organisms or are altered by their activities. (F) ● Explain how the three different types of rock are formed in the following ways: ° Igneous - rock that was once melted inside the earth is cooled and hardened, such as melted rock that reaches the earth's surface through a volcanic eruption ° Metamorphic - rock changes due to exposure to heat and pressure deep inside the earth, pressure and temperature change igneous and sedimentary rock into metamorphic rock ° Sedimentary - rock and other earth materials are broken down and worn away by weathering, the sediment is carried downstream and settles into layers at the bottom of rivers or lakes or oceans, more layers are deposited on top of the previous ones, the bottom layers are squeezed and cemented together by pressure, the compacted layers form into rock over time ● The geologic process that is responsible for the formation, breakdown and reformation of rock from one type to another is referred to as the rock cycle. (Enrichment, Taught at Sixth Grade) ● Compare and contrast how sedimentary, metamorphic and igneous rocks are formed. ● The three types of rock have distinct properties (e.g., color, texture, etc.) and special characteristics depending upon the environment in which they were formed including: ° Igneous - normally contains no fossils, rarely reacts with an acid, usually has no layering, usually made up of two or more minerals, may be light or dark colored, usually made up of mineral crystals of different sizes, sometimes has openings or glass fibers, may be fine-grained or glassy ° Metamorphic - rarely has fossils, may react with an acid, may have alternate bands of light and dark minerals, may be composed of one mineral (e.g., marble, quartzite, etc.), may have layers of visible crystals, usually made up of minerals of different sizes, rarely has pores or openings, may have bent or curved foliation (i.e., layers) ° Sedimentary - often contains fossils, may react with an acid, often has layers that are flat or curved, usually composed of pieces of sediment cemented or pressed together, has great color variety, particle size may be the same or vary, usually has pores between pieces ● Sort and classify rocks by how they were formed (e.g., by erupting volcanoes, flowing water carrying and depositing sediment, heat and pressure inside the earth, etc.) and by their unique characteristics. ✶ **Technology can be used to analyze and compare test results, connect to other classrooms to compare data or share samples, and document the findings.** ✶ **Note: It is important to use the term "soil," not "dirt." Dirt and soil are not synonymous.**		

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LAKEWOOD CITY SCHOOL DISTRICT STANDARDS-BASED SCIENCE CURRICULUM
THIRD GRADE

Earth and Space Science ✶ **Earth's resources can be used for energy. (3)** ● Many of Earth's resources can be used for the energy they contain. Renewable energy is an energy resource, such as wind, water or solar energy, that is replenished within a short amount of time by natural processes. Nonrenewable energy is an energy resource, such as coal or oil, that is a finite energy source that cannot be replenished in a short amount of time.	**Energy Resources** ✶ **Distinguishing between renewable and nonrenewable resources through observation and investigation is the emphasis for this content statement.** ● Identify that resources are things that we get from the living (e.g., forests, etc.) and nonliving (e.g., minerals, water, etc.) environment and that resources are necessary to meet the needs and wants of a population. ● All materials, energy, and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (F) ● Renewable resources are natural resources that are replaced by natural processes and replenished with the passage of time (e.g., trees, solar energy, water, etc.). ● Nonrenewable resources are natural resources that cannot be replenished in a short period of time and once they are used up, they cannot be replaced (e.g., fossil fuels including oil, natural gas and coal that take millions of years to form; uranium, etc.). ✶ **This can be connected to learning about the different forms of energy (PS grade 3). Electrical circuit or solar panel models can be used to demonstrate different forms of energy and the source of the energy.** ● According to the American Association for the Advancement of Science (AAAS), at the simplest level, energy can be thought of as "something needed to make things go, run, or happen." ● Explore ways people use energy (e.g., to cook their food, heat their homes, etc.) and explore how energy makes things work (e.g., batteries running a toy, electricity turning fan blades, etc.). ● Describe that energy can be obtained in a variety of ways from many sources (e.g., from food, gasoline, electricity, batteries, wood, coal, natural gas, etc.). ● Recognize that the sun is an energy source that warms the land, air and water. (Review from First Grade) ● Important Note: The main focus at third grade should be on energy resources (e.g., coal, oil, solar energy, etc.). The forms of energy including electricity, heat, light, sound and mechanical (i.e., energy related to motion) will be covered extensively at fourth and fifth grades. ✶ **The conservation of energy is explored within the content statement *Some of Earth's resources are limited.*** ✶ **Specific energy sources in Ohio are introduced, such as fossil fuels found in Ohio, new energy technologies, and the development of renewable energy sources within Ohio.** ● Nonrenewable energy resources include fossil fuels (i.e., petroleum, natural gas, propane and coal) and uranium (often referred to as nuclear energy).		

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	• Renewable energy resources include solar energy, geothermal energy, wind energy, hydropower (i.e., wave, tidal or hydroelectric power) and biomass. • Fossil fuels are found within the rocks of Earth's surface. They are called fossil fuels because they are thought to have been formed many millions of years ago by geological processes acting on dead animals and plants, just like fossils. • Fossil Fuels: Petroleum, Natural Gas and Propane - These fuels were formed from the remains of small sea creatures and plants that died and fell to the bottom of seas. Over many millions of years, layers of mud or other sediments built up on top of these dead animals and plants. The pressure from these layers and heat from below Earth's crust gradually changed the once-living material into oil and natural gas. Propane, a gas, is buried underground in sedimentary rock with petroleum and natural gas. ° Advantages - relatively cheap, usually easy to get, can be used to generate electricity ° Disadvantages - burning oil and natural gas produces carbon dioxide which is a major contributor to global warming, transporting oil around the world can produce oil slicks or spills which pollute beaches and harm wildlife, oil-based fuels provide less energy than natural gas • Fossil Fuel: Coal - This fuel was formed from plant material in ancient swamp forests. Millions of years ago trees and other plants grew quickly, and when they died they fell into the swamps. Water prevented the plant material from decaying completely and peat was formed. As time passed, layer upon layer built up. The pressure from these layers and heat from below the earth's crust changed the material into coal. ° Advantages - relatively cheap, large deposits left are reasonably easy to obtain with some coal being close to Earth's surface, relatively easy to transport because it is a solid substance ° Disadvantages - some sources of coal are deep below the ground and can be costly and difficult or even dangerous to mine, burning coal without first purifying it contributes to global warming as well as to the production of smog which is harmful to the health of living things, is a finite resource that will eventually run out, often contains impurities such as sulfur that pollute the atmosphere when they burn and contribute to acid rain, burning coal produces more carbon dioxide than oil, burning coal produces some carbon monoxide and soot or smoky flames, provides less energy than oil • Uranium - Nuclear fuel is made from naturally-occurring radioactive materials, such as uranium, found in rocks. These materials are extracted, concentrated and formed into "fuel rods." When placed close together, they set off nuclear reactions that generate heat. This heat is used to turn water into steam and generate electricity. ° Advantages - does not produce polluting gases so it will not contribute to global warming because there is no burning involved, relatively long-lasting supply of radioactive materials ° Disadvantages - world's source of uranium and other radioactive materials is finite so it will not last		**Harcourt** • Rocking and Rolling **Treasures** • Time for Kids: What's in Store for the Future • Recycling **3rd Grade Science** • Unit C: Chapter 5 (Earth's Resources) • Unit C: Chapter 6 (Forces Shape the Land) • Unit D: Chapter 7 (Earth's Water) • Unit D: Chapter 8 (Earth in Space) **Bill Nye** • Rocks & Soil **Kits** • Weather

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	forever, waste remains radioactive for a long time (100^{+} years), radioactive materials could escape into the environment if a nuclear reaction is not contained and controlled, exposure to radiation may cause cancer ● Solar Energy - Solar energy comes directly from the sun. Solar energy drives processes in the atmosphere that cause wind and waves. It is absorbed by green plants and used to make food during photosynthesis. Ultimately, the sun is the source of most energy resources available, including fossil fuels. Solar energy can be used to heat a fluid, such as water in solar collector panels, or to generate electricity in photovoltaic (PV) cells that convert sunlight directly into electricity (e.g., PV cells power solar calculators, etc.). ° Advantages - most abundant source of energy on Earth along with nuclear energy, non-polluting, relatively maintenance free ° Disadvantages - less available energy in areas near the poles of Earth, cloud cover can reduce efficiency, until recently PV cells were very costly to produce but they are getting less expensive ● Geothermal Energy - Geothermal energy comes from heat inside the earth. The mantle and core of the earth are very hot. Sometimes this heat comes near the earth's crust. The existence of hot springs, geysers and volcanoes point to evidence of hot rocks below Earth's surface. In some places, there are reservoirs of hot water below the surface that can be tapped to provide energy to warm our houses or to make electricity. ° Advantages - sources for thermal energy will not run out, running costs can be very low, can be non-polluting ° Disadvantages - can only be used in areas around the world where the crust is thin and hot rocks are near Earth's surface, sometimes the hot water that is pumped to the surface contains pollutants such as sulfur ● Wind Energy - When the earth is warmed by the sun, the ground absorbs some of this heat. The heated ground warms the air above it. Hot air rises in what are called convection currents. The uneven heating of Earth's surface causes winds. For example, if the sun's rays fall on land and sea, the land heats up more quickly. This results in the air above the land moving upwards more quickly than the air over the sea (i.e., hot air rises). As a result, the colder air over the sea will rush in to fill the gap left by the rising air. It is processes like these that result in high and low pressure areas, and thus winds. Wind power, energy from the wind, has been used for centuries to power windmills that turn mechanical machinery to do physical work, like crushing grain, milling wheat or pumping water. More recently, large wind turbines have been designed to generate electricity. These new wind turbines are collected together in wind farms. ° Advantages - non-polluting, freely available in many areas, wind turbines are becoming more efficient and the cost of the electricity that they generate is falling		**Websites** http://www.rocksforkids.com/RFK/identification.html http://www.rocksforkids.com/RFK/TableofContents.html http://www.kidsrecycle.org/ http://www.kidsplanet.org/

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	° Disadvantages - about twenty wind turbines need to be linked together in wind farms to be efficient which may look unsightly and can be noisy, wind farms need to be located reasonably close to populations so that the electricity generated can be distributed, winds are intermittent and do not blow all the time ● Wave Energy - Waves are caused by the action of wind on a body of water. Waves can be many meters in height and contain a great deal of energy. This energy can be harnessed to drive turbines that generate electricity. ° Advantages - non-polluting, relatively quiet to operate, does not affect wildlife ° Disadvantages - turbines can be unsightly, wave heights vary considerably so turbines cannot produce a constant supply of energy ● Tidal Power - The difference between high tide and low tide can be many meters. If, at high tide, water can be trapped behind a barrage or barrier and then let out as the tide ebbs, this water can be passed through a turbine that can generate electricity. ° Advantages - the rise and fall of tides is constant and does not depend on the weather, production of electricity is relatively cheap ° Disadvantage - present designs do not produce a lot of electricity, barrages or barriers across river estuaries can change the flow of water which may harm habitats for birds and other wildlife ● Hydroelectric Power - Rivers flow from relatively high areas of land, such as hills or mountains, to the sea. Flowing rivers have energy. If a dam is built across a river, then water can be allowed to flow in a controlled way through a turbine that generates electricity. ° Advantages - rivers flow continually and provide a constant source of energy, supply of electricity is relatively cheap once the dams are built ° Disadvantages - good sites for hydroelectric power (such as mountainous regions) are not always near towns, building large dams may flood large areas and cause damage to existing habitats, changing the flow of a river will affect the water supply to lands nearer to the sea and may cause problems related to irrigation of crops ● Biomass - Biomass is material from living things. This could be plant material, animal material or even bacteria. Plant material, such as wood or hay, can be burned to provide heat to create steam and to generate electricity in a power station. Animal waste (e.g., animal slurries from barns, etc.) can be treated to provide gases that can be burned to generate electricity. Landfill sites emit gases (mainly methane) that also can be used to provide energy. Some plant materials, such as sugarcane and maize (i.e., sweet corn), can be fermented to produce ethanol, which can be used in cars as a substitute for gasoline. Crops can be grown as energy crops rather than food crops. Fast-growing trees, such as willows, can be farmed for		

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	energy. ° Advantages - energy can be extracted from wastes, can be used in similar ways to fossil fuels, readily available worldwide ° Disadvantages - no more environmentally-friendly than fossil fuels because burning biomass produces carbon dioxide which is a major contributor to global warming ● Recognize the differences between renewable and nonrenewable energy. Be able to provide examples of each. (V) ● Research the efficiency and cost of different types of energy resources (renewable and/or nonrenewable). Compare and contrast the findings. Present or discuss finding with the class. (V) ● Develop a plan to determine the most effective method of collecting renewable energy (e.g., shapes/number/materials used in wind or water turbines, locations that allow solar panels to collect the most energy from the sun, etc.). (V) ✶ **Ohio must be compared to other states regarding energy sources.** ● When comparing areas and determining which renewable energy sources could be used consistently in which states, the following key factors should be kept under consideration: ° Solar energy can be gathered anywhere, but obviously more can be gathered in areas on or near the equator. ° There are not many areas that currently use geothermal energy cost effectively. ° Wind energy can be harnessed only in areas that are subject to reasonably consistent and strong winds. There may be large areas of flat land or areas near coasts that are subject to prevailing winds. Offshore wind farms in coastal waters are being developed because winds are often stronger blowing across the sea. If there are sufficient winds, a twenty-turbine wind farm, such as those found in Ohio, can generate enough electricity for a small town. ° Wave energy or tidal power can only be harnessed in coastal areas, close to the shore. ° Hydroelectric power exists in many areas where there are fast-flowing rivers. These are often hilly or mountainous regions where rivers flow down steep slopes. On flatter land, rivers flow more slowly, so very large artificial dams have to be built to create reservoirs. The reservoirs then provide a “head of water” that can be allowed to fall through a turbine. Most people live on flatter land, so access to hydroelectric power requires large dams to be built, which may result in flooding of local areas. ° Biomass, in the form of wood, was the major source of energy about two hundred years ago. In many parts of the developing world biomass (not always from trees) is still the major source of energy. ● Research, design and/or construct a model of a simple energy collection system for a specific location (use locations in Ohio or areas near water/prairies/rivers/mountains). Provide a selection of everyday materials		

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	for the model (rather than a preplanned kit), such as PVC piping and Mylar to make a windmill or water-wheel to allow student-led investigation and design. (V)		
Earth and Space Science ✶ **Some of Earth's resources are limited. (3)** ● Some of Earth's resources become limited due to overuse and/or contamination. Reducing resource use, decreasing waste and/or pollution, recycling and reusing can help conserve these resources.	**Conservation of Resources** ✶ **Within third grade, the focus is on the different types of Earth's resources, how they are used and how they can be conserved.** ● Earth's resources are natural resources that are found on or in the earth or are created through earth's natural processes and do not include manufactured goods or manmade resources. Manufactured resources should be referenced only in the conservation of the natural resource from which they originate (e.g., plastics come from fossil fuels and therefore recycling of plastics is a way to conserve fossil fuels, etc.). (F) ● Limited resources are often considered to be fossil fuels, metals or minerals. There are a "limited" amount of these resources on the planet that can be obtained in a reasonable time period. Limited resources can be used up and cannot be replaced. ● Resources also can be limited through overuse or contamination. For example, water, air, soil and other natural resources that come from plants or animals are subject to overuse or contamination if not conserved. ● Recognize that some of Earth's resources are limited and need to be conserved. (V) ● Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. For example, they are treating sewage, reducing the amounts of materials they use, and regulating sources of pollution such as emissions from factories and power plants or the runoff from agricultural activities. (F) ● Discuss positive and negative ways humans affect and impact the environment (e.g., using insecticides and pesticides, recycling, etc.). ✶ **Scientific data should be used to evaluate and compare different methods of conservation (e.g., effectiveness of different kinds of recycling such as paper vs. metal). The concentration must be the science behind the conservation of resources and why certain resources are limited. Reducing or limiting the use and/or waste of resources should be emphasized (rather than concentrating only on recycling of resources).** ● Explain how the supply of many nonrenewable resources is limited and can be extended through reducing or limiting, reusing and recycling, but cannot be extended indefinitely: ° Reducing - preventative way of using less of a resource through careful, decreased or limited		

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	consumption ° Reusing - taking something already manufactured and using it for the same purpose again or for a different purpose ° Recycling - turning materials that would otherwise become waste into valuable resources by taking them to the curb or to a collection facility which generates financial, environmental and social returns locally as well as globally (e.g., collecting used bottles, cans, newspapers, glass, cardboard, etc.) ● Identify materials that can be reused or recycled (e.g., newspaper or other types of paper, glass, aluminum, plastic, etc.). ● As a class or school project, design a community recycling center that can be used to (Enrichment): ° Collect and sort materials that can be recycled (e.g., plastics, glass, aluminum, etc.). ° Compare and contrast characteristics of common recyclable objects. ° Compare the different recyclable plastics according to their physical properties (e.g., transparent, hard/soft, rigid/flexible, heavy/light, etc.). ° Explain the stages in recycling of objects used in daily life (e.g., paper, plastic, glass, aluminum, etc.). ° Reuse materials for a different purpose (e.g., art project, milk carton birdhouse, paper mache, bottle terrarium, etc.). ● Research different types of recycling (e.g., paper, plastics, metals, glass, etc.) and make a comparison table to document methods, effectiveness, recycling rates, benefits and/or problems. (V) ● Investigate and describe how Earth's resources (e.g., water, air, wildlife, rocks, soil, etc.) can be maintained and conserved, such as: ° Air - Preventing pollution through the use of clean energy resources and reduction in the use of burned fuels contributes to the conservation of air. ° Energy Resources - Individuals need to analyze the environmental impact of electrical production and usage and identify how people can save energy by turning things off when they are not using them (e.g., lights, motors, computers, etc.). ° Metals and Minerals - Iron, gold, silver, platinum, copper and aluminum are conserved primarily through reuse and recycling. Some metals are rare, and therefore more valuable, which makes conservation more important. Salt is usually mined or extracted from sea-water. ° Soil - Sand or clay is often lost through erosion and/or weathering. Conservation of soil through the planting of native plants (not farming) allows plant roots to secure the soil and prevent erosion and/or weathering. ° Water - Water can be conserved through preventing pollution of ground-water sources and bodies of water. Transportation of resources, such as oil and other goods, can contribute to pollution of oceans		

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	and other saltwater environments. Fertilizers and pesticides can be major sources of pollutants because they contaminate sources of freshwater. Pesticidal or insecticidal runoff can contain any number of chemical or solid wastes carried by water through storm sewers and waterways. ● Design and carry out a plan to reduce the use of specific resources at the school, school district or local community. Data collection can include water use, paper use, soil erosion, composting (food waste), hazardous waste and examination of the types of programs available in the local area. Once data is analyzed and plans are chosen, present findings to school and/or community officials. (V) ● Explore and describe environmental problems that impact Earth's resources (e.g., acid rain, air pollution, soil pollution, weathering, erosion, littering, insecticidal and pesticidal runoff, deforestation, forest fires, oil spills, landfills, construction, etc.). ● Research ways to solve environmental problems and lessen their effects on the basic needs of living things and the possible endangerment or extinction of organisms. ● Explain why people, when building or creating something, need to determine what it will be made from and how its development will affect other people, the environment and conservation of Earth's resources.		

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LAKEWOOD CITY SCHOOL DISTRICT STANDARDS-BASED SCIENCE CURRICULUM
THIRD GRADE

THIRD GRADE
MATTER (FROM MATTER AND FORMS OF ENERGY)
Physical Science Strand (PS)

Content Statements	Content Elaboration and Clarification	Resources from 2017-18 Update	Resources linked from LKWD 2012 Course of Study
Physical Science ✶ **All objects and substances in the natural world are composed of matter. (3)** ● Matter takes up space and has mass*. ● Note: While mass* is the scientifically correct term to use in this context, the NAEP 2009 Science Framework (page 27) recommends using the more familiar term "weight" in the elementary grades with the distinction between mass and weight being introduced at the middle school level. In Ohio, students will not be assessed on the differences between mass and weight until Grade 6.	**Properties of Matter** ✶ **Objects are composed of matter and matter has observable properties.** ● Observable properties are characteristics of objects and materials that can be observed with the senses (i.e., seen, felt, heard, tasted and smelled). ● Physical properties are attributes that are primarily sensory and generally measurable (e.g., area, hardness, texture, shape, color, weight, volume, etc.). ● Investigate and describe physical properties of objects and materials including, but not limited to: ° Color ° Float or sink ° Hardness ° Luster (i.e., shininess) ° Magnetic or nonmagnetic ° Malleability (i.e., flexibility) ° Odor ° Shape ° Size (e.g., length, width, area, volume, etc.) ° Temperature ° Texture (e.g., smooth, rough, soft, etc.) ° Weight or mass ✶ **Matter is anything that has mass* and takes up space. All solids, liquids and gases are made of matter.** ● Name observable differences between the three states of matter. (V) ✶ **Volume is a measure of the amount of space an object takes up. Volumes of liquids can be**	**Pacing Guide:** ● Second Unit of the Year, 12 Weeks Common Summative Assessments **RESOURCES:** DSCR-Changes in Matter, Red, 8-Pack Discovery Links 2-Matter Changes, Single Copy Science Experiments That Fizz and Bubble-Fun Projects for Curious Kids (Capstone)	**Bill Nye** ● Chemical Reaction ● Phases of Matter **3rd Grade Science Textbook** ● Unit F: Chapter 11 (Matter) ● Unit F: Chapter 12 (Energy) **Kits** ● States of Matter (First Grade) **4th grade textbook (units)** ● All About Matter ● Energy & Change ● Describing Matter ● Observing State of Matter ● Causing Changes in Matter

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Important Note: ● The Physical Science Third Grade Content Statement "Heat, electrical energy, light, sound and magnetic energy are forms of energy" has been integrated with Fourth and Fifth Grade energy content. See the Electricity and Heat unit at Fourth Grade and the Light and Sound unit at Fifth Grade. ● The Physical Science Fourth Grade Content Statement "The total amount of matter is conserved when it undergoes a change" has been integrated with this Third Grade matter content, but it is also reviewed during the Electricity and Heat unit at Fourth Grade.	**measured in metric units with a beaker or graduated cylinder.** ✶ **Weight is a measure of gravity (how strongly Earth's gravity pulls the object toward Earth). Weight is measured using a scale. For any given location, the more matter there is in an object, the greater the weight.** ● Everything on or anywhere near Earth is pulled toward Earth's center by gravitational force. Weight is a measure of the force, the pull, of gravity on an object. The force of gravity depends on how much mass an object has. On Earth, objects with a large mass weigh more. ✶ **Opportunities to investigate and experiment with different methods of measuring weight and liquid volume must be provided.** ● Standard tools used to measure weight or liquid volume may include, but are not limited to: ° Base ten blocks and/or Unifix® cubes (e.g., to measure the volume of containers used to hold liquids, etc.) ° Beakers ° Electronic balances and/or electronic scales (optional) ° Graduated cylinders ° Measuring cups ° Measuring spoons ° Pan balances and/or simple scales ° Measuring tapes, meter sticks, rulers and/or yardsticks (e.g., to measure the volume of containers used to hold liquids, etc.) ° Spring scales ● Measure matter in standard (e.g., inches, feet, meters, cups, grams, kilograms, teaspoons, pounds, etc.) and nonstandard (e.g., light/heavy, small/big, tall/short, number of paper clips, number of Unifix® cubes, etc.) units. ● Measurements may be made using the metric and/or English (standard) systems (e.g., Celsius or Fahrenheit, meters or yards, centimeters or inches, cubic centimeters or ounces, kilograms or pounds, etc.). ● Distinguish between weight and volume. Represent the differences in words and visual models. (V) ● Given three different items, measure as many properties for each item as possible. Record the measurements for each item on a separate index card. Switch samples with another group and identify which set of measurements belong with which item. (V) ✶ **Objects are made of smaller parts, some too small to be seen even with magnification. Matter continues to exist, even when broken into pieces too tiny to be visible.**	Fundamental Experiments-Liquids and Solids (Bearport) Joe, Joe the Wizard Brews Up Solids, Liquids, and Gases (Capstone-Picture Window)	

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	● Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means (e.g., by weighing or by its effects on other objects). For example, a model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon; the effects of air on larger particles or objects (e.g., leaves in wind, dust suspended in air); and the appearance of visible scale water droplets in condensation, fog, and, by extension, also in clouds or the contrails of a jet. The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish (e.g., sugar in solution, evaporation in a closed container). Measurements of a variety of properties (e.g., hardness, reflectivity) can be used to identify particular materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (F) ● Observe a variety of objects with parts that are easily seen and parts that are too small to be seen. For example, a bicycle is made up of the three states of matter. The handlebars, seat and the tires are solids, which are easily visible. The tires on a bike are filled with air, but air is only recognized as a gas because air exerts pressure on the inside of the tires when they are inflated. The oil on the bicycle chain is a liquid, which may or may not be easily seen. ● Recognize that matter continues to exist when broken into pieces too tiny to be visible. (V) ✶ **Note: Atomic and subatomic nature of matter is not appropriate at this grade. Math standards at this grade limit volume measurements to liquids measured to the nearest whole number. This document follows the recommendations of the NAEP 2009 Science Framework (see page 27) for dealing with the concepts of mass and weight.** ● Matter is made up of tiny particles called atoms that cannot be seen with the unaided eye. All concepts related to atoms will be taught at middle school.		
<u>Physical Science</u> ✶ **Matter exists in different states, each of which has different properties. (3)** ● The most common states of matter are solids, liquids and gases.	**<u>States of Matter</u>** ✶ **Gases, liquids and solids are different states of matter that have different properties. Liquids and solids do not compress into a smaller volume as easily as do gases. Liquids and gases flow easily, but solids do not flow easily. Solids retain their shape and volume (unless a force is applied). Liquids assume the shape of the part of the container that it occupies (retaining its volume). Gases assume the shape and volume of its container.** ● Explain that matter exists in different states (e.g., solid, liquid and gas) and that each state has distinct physical properties.		

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• Shape and compressibility are properties that can distinguish between states of matter.
• One way to change matter from one state to another is by heating or cooling.
	• The properties of a gas include*:
	  ° Assumes the shape and volume of its container
	  ° Particles can move past one another
	  ° Compressible, lots of free space between particles
	• Gases have no definite shape or volume; they occupy whatever volume is available. Gases take up space, can be weighed and exert pressure (i.e., air cannot be seen directly but its effects can be felt as wind, measured on a barometer, measured with an air pump or air compressor, etc.).
	• Examples showing how gases assume the shape and volume of a container may include, but are not limited to, blowing up a large balloon versus a small balloon, inflating car or bike tires using an electronic air pump at a service station, using a hand-held air pump to blow up balls or rafts, etc.
	• The properties of a liquid include*:
	  ° Assumes the shape of the part of the container which it occupies
	  ° Particles can move or slide past one another
	  ° Not easily compressible, little free space between particles
	• Liquids maintain a fixed volume but they adapt to the shape of the containers they occupy; liquids do not change volume, but they change shape.
	• The properties of a solid include*:
	  ° Retains a fixed volume and shape
	  ° Rigid - particles are locked into place
	  ° Not easily compressible, little free space between particles
	• Recognize three different states of matter. (V)
	• Identify and describe the physical properties of matter in its various states.
	• Prepare and use a key to classify various kinds of matter (e.g., by physical properties of solids, liquids and gases, etc.).
	✶ **Heating may cause a solid to melt to form a liquid, or cause a liquid to boil or evaporate to form a gas.**
	• Solids maintain a fixed volume and shape unless an added force (e.g., cutting, tearing, etc.) or energy (e.g., adding heat to boil or melt matter, etc.) changes them.
	• Matter may change states through boiling, freezing, melting, evaporation, condensation and sublimation.
	• The process of changing a liquid into a gas is called evaporation. For example, when water boils for a long period of time, the liquid changes into a gas that cannot be seen. This gas is called water vapor.
	✶ **Cooling may change a gas into a liquid or cause a liquid to freeze and form a solid.**
			Websites
			
			http://www.sciencekids.co.nz/gamesactivities/stateматerials.html

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	● Liquids may change into gases, but gases also may change into liquids. This process is called condensation. For example: ° Droplets of water collect on the outside of a cup or glass filled with ice. Water vapor is a gas in the air and when it comes in contact with the cold glass, its temperature decreases. The gas particles lose energy and the gas turns into a liquid, which can be seen as droplets on the outside of the glass. ° On cool mornings, small droplets of water called dew may appear on grass and windows. This happens when water vapor in the air touches cool objects and loses energy. Particles of water vapor come closer together. The particles condense and change from a gas into drops of liquid water. ° Water vapor from the breath of an organism condenses on a cold day. ● Predict the fastest way for ice to form. Design an investigation to determine what parameters ensure the fastest formation (e.g., change temperature of the starting water using cold, room-temperature and very hot water; condition the starting water with salt or sugar, change the starting water by adding food coloring, etc.). (V) ✶ **Conducting experiments or investigations that demonstrate phase changes, such as the melting or freezing of substances other than water (e.g., vinegar, vegetable oil, sugar, butter) must be used to reinforce the concept that materials other than water also go through phase changes.** ● Important Note: When matter undergoes phase changes, the substances are usually experiencing physical changes. These changes can be simply classified as evaporation, condensation, melting, freezing, etc. It is not necessary to determine the differences between physical and chemical changes during this unit. However, experiencing chemical changes may be motivating and may provide a comparison point for phase changes. Introducing chemical changes may also provide background knowledge to support the teaching of matter at later grades. Therefore, content information has been included in this unit for both types of changes. However, it is important to keep in mind that when substances undergo changes, there may be a combination of chemical and physical changes occurring at the same time, which is why it is sometimes difficult to classify changes in matter as just one type or the other. ● Use the senses to describe changes in solids, liquids and gases (e.g., cooking foods, freezing and melting ice, evaporating water, observing dry ice, etc.). ● Conduct inquiry investigations that illustrate changes in matter and infer the characteristics of physical changes including: ° Do not involve permanent changes in the properties of substances ° Do not produce or create new substances ° May result in changes in the states of matter of substances		

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	○ May result in observable changes in size, shape and/or configuration of substances ● Heating or cooling may change matter from one state to another (i.e., cause a change in phase). For example, heat causes the temperature of a substance to increase and its particles to gain more energy so that they are able to move faster and flow, causing a solid to change into a liquid (e.g., ice cream melting on a hot day, ice cubes melting in a glass, marshmallows on a stick melting over a campfire, etc.). ● Describe the energy flow or force that may cause a phase change to occur, such as: ○ Boiling a liquid into a gas ○ Condensing a gas into a liquid ○ Evaporating a liquid into a gas ○ Freezing a liquid into a solid ○ Melting a solid into a liquid (e.g., melting butter, melting chocolate, etc.) ● Conduct inquiry investigations that illustrate changes in matter and infer the characteristics of chemical changes including: ○ Are almost always very difficult or impossible to reverse ○ Involve permanent changes in the properties of substances ○ Often give off heat on their own ○ Produce or create new substances (e.g., produce gases, etc.) ● Chemical changes often result in the formation of different kinds of matter, where properties of the original materials change completely, such as: ○ Burning (e.g., burning paper, burning firewood, etc.). ○ Cooking (e.g., using eggs, flour, sugar and other ingredients to make pancakes or other food items which cannot be changed back into their original form, etc.) ○ Digestion ○ Mixing by combining two or more materials to form a new substance that has properties that are different from the original materials (e.g., mixing baking soda and vinegar, mixing glue and liquid laundry starch, etc.) ○ Rotting ○ Rusting ● Explore real-world examples of simple physical changes (e.g., evaporation, condensation, melting, changes in volume due to temperature, cutting, breaking, etc.) and simple chemical changes (e.g., burning, cooking, digestion, rusting, rotting, etc.) in matter. ● Compare and contrast the characteristics of physical and chemical changes in matter.		

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	✶ **Note 1: Purdue University* provides a table that can help in differentiating the properties of solids, gases and liquids. Teaching about the atomic structure as related to the phases is not appropriate for this grade level.** ✶ **Note 2: Only solids, liquids and gases are appropriate at this grade, even though other phases have been identified. The differences between boiling and evaporation are not dealt with at this grade.**		
Physical Science ✶ **The total amount of matter is conserved when it undergoes a change. (4-See "Important Note" under Strategies for Teaching and Learning.)** ● When an object is broken into smaller pieces, when a solid is dissolved in a liquid or when matter changes state (solid, liquid, gas), the total amount of matter remains constant. ● Note 1: At this grade, the discussion of conservation of matter should be limited to a macroscopic, observable level. ● Note 2: States of matter are found in PS grade 3. Heating and cooling is one way to change the state of matter.	**Conservation of Matter** ✶ **Some properties of objects may stay the same even when other properties change. For example, water can change from a liquid to a solid, but the mass* of the water remains the same. Parts of an object or material may be assembled in different configurations, but the mass* remains the same. The sum of all of the parts in an object equals the mass* of the object.** ✶ **When a solid is dissolved in a liquid, the mass* of the mixture is equal to the sum of the masses* of the liquid and solid.** ● Investigate changes that illustrate how the total amount of matter is conserved in everyday situations. Examples of how some properties of objects or materials may stay the same even when other properties change may include, but are not limited to: ° Bending, breaking, crumpling, cutting or tearing a substance (e.g., cutting or tearing or crumpling a piece of paper, breaking glass, etc.) ° Dissolving a substance in another substance (e.g., powdered drink mix in water, sugar in iced tea or water, etc.) ° Freezing a liquid into a solid (e.g., freezing fruit juice into popsicles, etc.) ° Melting a solid into a liquid (e.g., melting butter, melting chocolate, etc.) ° Mixing two or more materials together to form a new substance that still has the same properties as the original materials (e.g., mixing oil and vinegar to make salad dressing, mixing peanuts and chocolate chips to make trail mix, etc.) ° Taking apart an object (e.g., dismantling a toy, etc.) ● A liquid assumes the shape and volume of its container, so its shape can change, but the amount of matter will remain constant. For example, when milk is poured into a glass, it takes the shape of the glass. If the milk is spilled out of the glass, it would spread all over an area. If an individual was then able to clean up the milk and put it all back into the glass, it would still be the same of amount of milk. The volume of the milk stays the same; only its shape changes. ● Explain why the volume of water decreases when placed in an open container and left to sit for an		

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	extended period of time. (V) ● Explain why the volume of some liquids, other than water, decreases when placed in an open container and left to sit for an extended period of time (e.g., rubbing alcohol, nail polish remover or acetone, Tang® or Kool-Aid®, etc.). ● Investigate what happens to the total amount of mass* during many types of changes (e.g., ice melting, salt dissolving, paper tearing, candle burning, Alka Seltzer® in water, etc.). Propose reasons for any difference in the final weight (mass). Design a revised experiment to test proposals. (V) ● When two substances are mixed, a new substance with different properties may be formed; such occurrences depend on the substances and the temperature. No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (F) ● Recognize that the amount of matter stays constant during any change. (V) ✶ **At this grade level, the discussion of conservation of matter should be limited to a macroscopic, observable level. Conservation of matter must be developed from experimental evidence collected in the classroom.** ✶ **After the concept has been well established with experimental data and evidence, investigations can include interactions that are more complex where the mass* may not appear to stay constant (e.g., fizzing tablets in water).** ✶ **Note: Mass* is an additive property of objects and volume is usually an additive property for the same material at the same conditions. However, volume is not always an additive property, especially if different substances are involved. For example, mixing alcohol with water results in a volume that is significantly less than the sum of the volumes.**		

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LAKEWOOD CITY SCHOOL DISTRICT STANDARDS-BASED SCIENCE CURRICULUM
THIRD GRADE

THIRD GRADE
BEHAVIOR, GROWTH AND CHANGES
Life Science Strand (LS)

Content Statements	Content Elaboration and Clarification	Resources from 2017-18 Update	Resources linked from LKWD 2012 Course of Study
Life Science ✶ **Offspring resemble their parents and each other. (3)** ● Individual organisms inherit many traits from their parents indicating a reliable way to transfer information from one generation to the next. ● Some behavioral traits are learned through interactions with the environment and are not inherited.	**Offspring** ✶ **Organisms are similar to their parents in appearance and behavior but still show some variation.** ● Organisms are all living things, i.e., plants and animals, including humans. (Review from Second Grade) ● Offspring acquire a mix of traits from their biological parents. Different organisms vary in how they look and function because they have different inherited information. In each kind of organism there is variation in the traits themselves, and different kinds of organisms may have different versions of the trait. The environment also affects the traits that an organism develops - differences in where they grow or in the food they consume may cause organisms that are related to end up looking or behaving differently. (F) ● Examples of how offspring resemble their parents and each other may include, but are not limited to: ° Behavioral traits (e.g., organisms migrate, hibernate, become dormant, etc.) ° Body coverings (e.g., fur, feathers, scales, skin, etc.) ° General classification (e.g., can live in water, can fly, can lay eggs, etc.) ° General coloring (e.g., brown beavers, red male cardinals, yellow sunflowers, etc.) ° Life cycles (i.e., complete or incomplete metamorphoses) ° Structures or appendages and their functions (e.g., leaves, roots, stems or trunks, thorns, arms, legs, heads, fins, horns, tails, talons, antennae, webbed feet, wings, etc.) ● Examples of how offspring have some variation from their parents may include, but are not limited to: ° Differences in their appearance during their life cycles (e.g., tadpole to frog, caterpillar to butterfly, etc.) ° Differences in their coloring (e.g., eye color, hair color, fur color, etc.) ° Differences in their patterns of growth (e.g., a plant grown from a seed may have fewer flowers than the original plant where the seed came from, a tree grown from a seed may have less fruit than the tree where the seed came from, etc.)	**Pacing Guide:** ● Third Unit of the Year, 12 Weeks Common Summative Assessments **RESOURCES:** FOSS Next Generation-Structures of Life Kit Disgusting & Dreadful Science-Stinky Skunks and Other Animal Adaptations (Crabtree) Disgusting & Dreadful	**Harcourt Resources** ● Rosie the Visiting Dog ● Alejandro's Gift ● Turtle Bay ● Wild Shots-It's My Life **3rd Grade Science textbooks** ● Unit A: Chapter 2 (Animals) ● Unit B: Chapter 3 (Relationships Among Living Things) ● Unit B: Chapter 4 (Ecosystems in Balance)

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	° Differences in their size (e.g., height, weight, etc.) ● Some behavioral traits are learned through interactions with the environment and are not inherited (e.g., a bear teaches its young to fish, parents teach their children how to follow their instincts to avoid pain or injury, humans teach animals "tricks" or how to behave properly as a house pet, a mother cat teaches its kittens how to clean their fur, animals teach their young how to avoid predators, etc.). ● Give examples of variations among individuals of a local population (e.g., height, color, weight, etc.). (V) ✶ **Although the immature stages of some living things may not resemble the parents, once the offspring matures, it will resemble the parent. At this grade level, the focus is on establishing, through observation, that organisms have a reliable mechanism for ensuring that offspring resemble their parents.** ● Organisms will only reproduce organisms of the same kind (e.g., an apple seed will only produce an apple tree, two purebred Labrador Retrievers will only produce purebred Lab puppies, etc.). ● Immature offspring may not initially resemble the parents (e.g., young chick or penguin feathers are soft and fluffy compared to the adult feathers, fur or hair color often changes during the transition from immature offspring to adult, an organism's size often changes from smaller to bigger as the organism grows, etc.). ✶ **It is not appropriate or necessary to introduce the genetic mechanisms involved in heredity, however, care should be taken to avoid introducing the misconception that the individual organism has a way to select the traits that are passed on to the next generation.** ● Many characteristics of organisms are inherited from their parents. Other characteristics result from individual's interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (F) ✶ **As part of the study of the life cycle of organisms, the physical appearance of the adults will be compared to the offspring (e.g., compare butterflies to determine if the offspring look exactly like the parents).** ✶ **A considerable amount of animal behavior is directly related to getting materials necessary for survival (food, shelter) from the environment and that influences what an animal learns. The focus at this grade level is on examples provided through observation or stories of animals engaging in instinctual and learned behaviors.** ● Identify a living thing's need for (Review from First Grade): ° Environment that will allow for survival (e.g., provides adequate light, proper temperature, protection and natural defenses against predators, cover/shelter, etc.) ° Gases to take in (e.g., for breathing, etc.)	Science-Slimy Spawn and Other Gruesome Life Cycles (Crabtree) Disgusting & Dreadful Science-Killer Plants and Other Green Gunk (Crabtree) All About Animals Close Up-How and Why Do Animals Adapt? (Crabtree) All About Animals Close Up-How and Why Do Animals Change? (Crabtree) All About Animals Close Up-How and Why Do Animals Move? (Crabtree) All About Animals Close Up-How and Why Do Animals Communicate? (Crabtree) All About Animals	**Treasures** ● Time for Kids: Whose Habitat Is It? ● Penguin Chick ● Animal Homes ● Home Grown Butterflies ● Mother to Tigers **Reading A to Z** ● Honeybee ● Gorillas **Science A to Z** ● Life Cycles (science AZ) ● Habitats and Environments (science AZ) ● Plants (science AZ) **Bill Nye Videos** ● Plants ● Flowers Treasures ● Time for Kids: Saving the Sand Dunes

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	° Source of food or energy ° Water ● Different sense receptors are specialized for particular kinds of information, which may then be processed and integrated by an animal's brain, with some information stored as memories. Animals are able to use their perceptions and memories to guide their actions. Some responses to information are instinctive - that is, animals' brains are organized so that they do not have to think about how to respond to certain stimuli. (F) ● Instinctual or learned behaviors are generally behavioral traits that an animal uses within its environment to meet its survival needs, such as: ° Animals may migrate, and the population may increase or decrease, based on the amount of food, water, space and/or shelter that may be available to them (e.g., deer population in Ohio, etc.). ° Animals may migrate or hibernate based on weather, seasonal change or climate. ° Animals may stay in "groups" to increase their chances of survival (e.g., packs for protection, etc.). ● Groups can be collections of equal individuals, hierarchies with dominant members, small families, groups of single or mixed gender, or groups composed of individuals similar in age. Some groups are stable over long periods of time; others are fluid, with members moving in and out. Some groups assign specialized tasks to each member; in others, all members perform the same or a similar range of functions. (F) ● Observe animals engaging in instinctual and learned behaviors (e.g., through webcams, virtual or actual field trips to parks or zoos, websites such as the Ohio Department of Natural Resources, television series such as the Meerkat Manor® show, literature connections, etc.). ✶ **Some organisms have behavioral traits that are learned from the parent (e.g., hunting). Other behavior traits are in response to environmental stimuli (e.g., a plant stem bending toward the light).** ● Environmental stimuli that plants and/or animals may respond to may include, but are not limited to: ° Amount of available food and water (e.g., squirrels bury nuts to eat during the winter, desert animals eat foods that contain significant amounts of water and cacti store water in their stems to make up for what they cannot get directly from their environments, etc.) ° Amount of available sunlight (e.g., animals often bask in the sun to stay warm, etc.) ° Fire due to arson, volcanic eruption, lightning strike, etc. (e.g., some seeds need fire to germinate, etc.) ° Interactions with other organisms (e.g., fight or flight response to predators, chameleons changing their colors to hide from predators, etc.) ° Weather and seasonal changes (e.g., migration, hibernation, dormancy, trees lose their leaves, etc.)	Close Up-What Kinds of Coverings Do Animals Have? (Crabtree) All About Animals Close Up-How and What Do Animals Learn? (Crabtree) All About Animals Close Up-How and What Do Animals Eat? (Crabtree) All About Animals Close Up-How and Why Do Animals Build Homes? (Crabtree) All About Animals Close Up-How and Why Do Animals Build Homes? (Crabtree) All About Animals Close Up-How and Why Do People Copy Animals? (Crabtree)	● Time for Kids: Washington Weed Whackers **3rd Grade Science textbooks** ● Unit A: Chapter 1 (Plants) ● Unit B: Chapter 3 (Relationships Among Living Things) ● Unit B: Chapter 4 (Ecosystems in Balance) **Science Kits** ● Plant growth and development ● Plants

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	● Plants react to environmental stimuli in a variety of ways, such as: ° Roots may grow miles to obtain water ° Stems or trunks may bend to obtain sunlight. ° Plants may grow or vary in appearance based on seasonal change or climate. ° Plants that do not receive enough sunlight and/or water may not grow as well as their parent plants (e.g., in height, amount of fruit produced, etc.). ● Compare and contrast how organisms, at a population level or an individual level, react to major environmental changes that are daily or seasonal and regular (e.g., temperature, nutrient availability, water availability, soil quality, seasonal change, etc.). ● Design an enriched environment that will support a classroom pet. Provide for all of its needs. The Smithsonian National Zoological Park states, "Environmental enrichment is the process of providing stimulating environments for Zoo animals in order for them to demonstrate their species-typical behavior, to allow them to exercise control or choice over their environment and to enhance their well-being." (V) ✶ **At this grade level, the definition of either instinctual or learned behavior is not learned. The focus is on making observations of different types of plant and animal behavior.** ✶ **Technology (e.g., a webcam) can be used to observe animals in their natural or human-made environments.** ● Conduct a real-time observational study of a familial grouping of organisms. Use webcams to view animals in their natural habitat or simulated environments to observe and record physical characteristics of the animals as well as behavioral traits that are taught from parent to offspring. (V) ● Develop a chart that compares features such as stages of development, food sources, where an organisms is found in the environment, and physical appearance to emphasize the similarities and differences between offspring and parents. (V)		**4th grade textbook (units)** ● Life Cycles of Plants **Science A to Z** ● Life Cycles ● Habitats and Environments ● Invertebrates ● Vertebrates **Bill Nye** ● Reptiles ● Insects ● Fish ● Mammals ● Amphibians ● Birds
Life Science ✶ **Individuals of the same kind differ in their traits and sometimes the differences give individuals an advantage in surviving and reproducing. (3)**	**Traits** ✶ **Organisms have different structures and behaviors that serve different functions. Some plants have leaves, stems and roots; each part serves a different function for the plant. Some animals have wings, feathers, beaks; each part serves a different function for the animals.** ● Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior and reproduction. (Boundary: Stress at this grade level is on understanding the macroscale systems and their function, not microscopic processes.) (F) ● Adaptations are internal and external features, as well as behaviors, that help living things survive in their		

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• Plants and animals have physical features that are associated with the environments where they live. • Plants and animals have certain physical or behavioral characteristics that improve their chances of surviving in particular environments. • Individuals of the same kind have different characteristics that they have inherited. Sometimes these different characteristics give individuals an advantage in surviving and reproducing. • Note: The focus is on the individual, not the population. Adaption is not the focus at this grade level.	surroundings. • Physical and behavioral adaptations can be used for a variety of functions including, but not limited to: ° Gathering and storing water (e.g., thick stems, long roots, etc.) ° Motion (e.g., webbed feet, wings, etc.) ° Obtaining energy or food (e.g., teeth, claws or talons, beaks, tongues, broad leaves for capturing sunlight, etc.) ° Protection from environmental conditions related to seasonal change, weather and/or climate (e.g., thick fur, thin skin, blubber, migration, hibernation, dormancy, etc.) ° Protection from predators or enemies (e.g., camouflage, mimicry, body coverings, thorns, bark, poisonous chemicals or toxins, coloring, etc.) • Describe plant structures and their functions including: ° Roots anchor and provide support as well as absorb water and nutrients. ° Stems or trunks transport water and nutrients. ° Leaves make food. ° Stamens, filaments, pistils, flowers, ovaries, sepals and petals are all involved in the reproduction of plants. • Describe the reproductive process of plants, i.e. pollination, including: ° Flowering plants must be pollinated in order to produce seeds. ° Many plants are pollinated by bees. ° A flower's pollen sticks to a bee, but some falls off when the bee feeds at other flowers. ° One seed produces one plant; but one plant can produce many seeds. • Investigate physical (e.g., various types of roots, coloration, coverings, capacity for water, leaf size and structure, poisons, etc.) and behavioral adaptations of plants (e.g., losing leaves during changing seasons, dormancy, phototropism, etc.) and relate them to their specific survival functions (e.g., reproduction, protection from predators, etc.). • Identify physical (e.g., coloration, body coverings, teeth, feet, beaks, camouflage, etc.) and behavioral adaptations of animals (e.g., migration, hibernation, protection from predators, mimicry, etc.) and relate them to their specific survival functions (e.g., obtaining food, escaping or hiding from enemies, etc.). • Describe how certain characteristics or behaviors helps meet their basic needs and identify what basic needs are being met by these characteristics or behaviors. ✶ **The observation of body parts should be limited to gross morphology and not microscopic or chemical features.** ✶ **Comparison across species is not appropriate at this grade level; only observation of variation**		**Websites** http://www.worldbookonline.com/ewol/knowit/home?id=4 http://www.kidsbiology.com/animals-for-children.php http://sheppardsoftware.com Plant Adaptations Wisconsin Fast Plants: About Us Meet my Frogs : African Dwarf Frogs Dwarf Frog Central Owen and Mzee's Web Log - Lafarge Eco Systems http://kids.nationalgeographic.com/kids/animals/ Nearctica - Native Conifers of North America ... Ohio Trees Index Great Plant Escape Smithsonian Education - Partners in Pollina... What_are_adaptations worms Lesson 1.1, The Honey Bee Body

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	within the same species is expected. ● Conduct a comparative study of a population of plants in the school yard, measure and compare some of the following: root size (width and depth), leaf size (length and width), flower color, number of petals, time of year when plant blooms, number of seeds produced or when seeds are produced. (V) ✶ **This content statement can be combined with the observation of the life cycles of organisms and/or the observation of the similarity between offspring and parents.** ✶ **There may be variations in the traits that are passed down that increase the ability of organisms to thrive and reproduce. Some variations in traits that are passed down may reduce the ability of organisms to survive and reproduce. Some variations in traits that are passed down may have no appreciable effect on the ability of organisms to survive and reproduce.** ● Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates and reproducing. (F) ✶ **Variations in physical features among animals and plants can help them survive in different environmental conditions.** ● Name some physical features of plants and animals that are associated with the environment in which they live (e.g., coloration, location of eyes, type of feet, etc.). (V) ● Write a report explaining how the behavioral or physical characteristic is an advantage of a specific animal or plant for surviving in its environment (e.g., *what adaptations does a pine tree have for living in colder environments?*, etc.). (V) ✶ **Variations in color, size, weight, etc., can be observed as the organism develops.** ✶ **Plants and animals that survive and reproduce pass successful features on to future generations.** ✶ **Some grade-appropriate organisms to study are plants (e.g., radishes, beans) and insects (e.g., butterflies, moths, beetles, brine shrimp).** ✶ **Comparisons can be made in nature or virtually.** ✶ **Venn diagrams can be used to illustrate the similarities and differences between individuals of the same type.**		http://www.mbgnet.net/bioplants/adapt.html Habitat Web Quest: http://www2.lhric.org/course/irvingtn/rothchan/habitat1.htm
Life Science ✶ **Plants and animals have life cycles that are part of their adaptations for survival in their natural environments.**	**Life Cycles** ✶ **Plants and animals have life cycles that are adapted to survive in distinct environments (e.g., bean plants can be grown inside during winter, but cannot grow outside in the winter).** ● Explain and elaborate on how each phase of a plant or animal's life cycle contributes to an organism's adaptation for survival in its natural environment (e.g., some plants shed their leaves in the fall and experience new growth in the spring, most bird eggs will not hatch outside in the middle of an Ohio		**4th grade textbook (units)** ● Life Cycles of Animals

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(3) ● Over the whole earth, organisms are growing, reproducing, dying and decaying. The details of the life cycle are different for different organisms, which affects their ability to survive and reproduce in their natural environments. ● Note: The names of the stages within the life cycles are not the focus. ● Note: New organisms are produced by the old ones.	winter due to the extremely cold temperatures, butterfly eggs are usually hatched on the leaves of trees or plants that only grow in warmer climates, frog eggs cannot be laid and hatched when a pond is frozen solid in the winter, some animals hibernate during the winter and may or may not have young while they are hibernating, etc.). ● Explain why some animals have offspring in the spring and some plants produce seeds in the fall. (V) ✶ **Most life cycles start with birth, then progress to growth, development, adulthood, reproduction and death. The process can be interrupted at any stage.** ● Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles that include being born (sprouting in plants), growing, developing into adults, reproducing, and eventually dying. (F) ● Environmental changes may cause interruptions in the life cycles of organisms (e.g., weather or climate changes, reduction in water or nutrients necessary for survival, predator-prey interactions, human interference such as deforestation or construction, earth processes such as landslides or floods, pollution, etc.). ✶ **The details of the life cycle are different for different organisms.** ✶ **Observation of the complete life cycle of an organism can be made in the classroom (e.g., butterflies, mealworms, plants) or virtually.** ● Observe the life cycles of a variety of organisms (e.g., butterflies, lima beans, radishes, mealworms, frogs, etc.) using live plants and animals, pictures, videos, technology-based resources, etc. ● Observe and identify the stages of the life cycles of animals including: ° Three Stage/Incomplete Metamorphosis - egg, nymph, adult (e.g., grasshoppers, termites, mayflies, dragonflies, cockroaches, crickets, stoneflies, damselflies, frogs, etc.) ° Four Stage/Complete Metamorphosis - egg, larva, pupa, adult (e.g., honeybees, butterflies, moths, flies, beetles, etc.) ● Observe the life cycles of amphibians to determine that they have three stage life cycles (i.e., incomplete metamorphoses) in which they appear very different at each stage. ● Observe the life cycles of insects to determine that they have four stage life cycles (i.e., complete metamorphoses) in which they appear very different at each stage. Each of the four stages enables the insects to adapt to their environments for survival. For example: ° Eggs are deposited in a variety of places that provide nutrients to them as they continue their metamorphoses into the larval stage (e.g., butterflies lay eggs on the underside of leaves, mayflies lay eggs in water near algae, etc.). ° Larvae eat a lot and grow very quickly. As they develop, they have to shed their skins and spin new		

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	hard coverings. ° Pupae use the hard coverings for protection against predators until they are hatched. ● Compare and contrast cocoons and chrysalises. ● Observe the life cycles of mammals, reptiles, birds and fish to determine that they have life cycles with the following stages: ° Birth - animals are born or hatched from eggs ° Growth - animals get bigger ° Development - animals change into adults ° Reproduction - animals may produce their own young ° Death - the lives of animals come to an end ● Compare the life cycles of different animals including the stages of birth to adulthood, reproduction and death (e.g., egg-tadpole-frog, egg-caterpillar-chrysalis-butterfly, etc.). ● Observe and identify the stages of the life cycles of plants including: ° Germinating seeds ° Developing roots ° Sprouting and growing stems or trunks, leaves and/or flowers ° Reproducing ° Eventually dying ● Plan and conduct an experiment to find out the optimal conditions for seed germination. Include in the conclusions scientific information about why not all seeds germinated. (V) ● Describe the life cycles of various plants and observe their characteristics at different stages of growth and development. ● Differentiate between the life cycles of plants versus animals. ● Research the life cycles of animals and plants, making sure to explore a variety of organisms (e.g., amphibians, mammals, insects, deciduous plants, flowering plants, etc.). ● Given labeled photographs of stages of animal or plant life cycles, place them in sequence from egg to adult. (V) ✶ **Hand lens, magnifying lenses, metric rulers and scales are some of the tools that can be used to question, explore and investigate the physical appearance of living things.** ✶ **When studying living things, ethical treatment of animals and safety must be employed. Respect for and proper treatment of living things must be modeled. For example, shaking a container, rapping on insect bottles, unclean cages or aquariums, leaving living things in the hot sun or exposure to extreme temperatures (hot or cold) must be avoided.**		

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	✶ **The National Science Teachers Association (NSTA) has a position paper to provide guidance in the ethical use and treatment of animals in the classroom at http://www.nsta.org/about/positions/animals.aspx.** ● NSTA encourages individuals to ensure that animals are properly cared for and treated humanely, responsibly and ethically. ● Ultimately, decisions to incorporate organisms in the classroom should balance the ethical and responsible care of animals with their educational value.		

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