

Middle School Science Cycle Year 3
Earth

Month	Learner Outcomes / Standards	Content	Assessments	Resources
Sept.	8.1.1.1.1 Evaluate the reasoning in arguments in which fact and opinion are intermingled or when conclusions do not follow logically from the evidence given.	<p>Intro to Science, History and Nature</p> <p>How do our conclusions relate to our problem statements?</p> <p>How do making new scientific discoveries and formulating problem solving relate to criminal investigations and convictions?</p> <p>Why should our data analysis and concluding statements answer our questions or create new ones?</p> <p>Why is it important, in any investigation to concentrate on a single variable rather than changing many variables at the same time?</p> <p>How have people in various cultures contributed to the knowledge puzzle throughout history?</p> <p>How do patriotism and nationalism reduce/increase our ability to see value in the work of other people from different cultures?</p> <p>How has the advancement of technology contributed to the improvement or degradation of our society?</p> <p>Does our “ability” to do miraculous things in science mean we “should” be doing them?</p> <p>In a timeline from Copernicus (1400’s) to today, how has our improvement of our tools and global communications increased the speed of the spread of knowledge?</p> <p>Why is it important to continue improving our equipment and techniques when studying our world?</p>	<p>Labs, Quizzes, Tests, Group Discussions Worksheets Science Links</p>	<p>Websites, Textbooks, videos,</p>
Cont	8.1.1.2.1 Use logical reasoning and imagination to develop descriptions, explanations, predictions and models based on evidence.			
Cont	8.1.3.2.1 Describe examples of important contributions to the advancement of science, engineering and technology made by individuals representing different groups and cultures at different times in history.			
Cont	8.1.3.3.1 Explain how scientific laws and engineering principles, as well as economic, political, social, and ethical expectations, must be taken into account in designing engineering solutions or conducting scientific investigations.			
Cont	8.1.3.3.2 Understand that scientific knowledge is always changing as new technologies and information enhance observations and analysis of data. For example: Analyze how new telescopes have provided new information about the universe.			
Cont	8.1.3.3.3 Provide examples of how advances in technology have impacted the ways in which people live, work and interact.			
Cont	8.1.3.4.2 Determine and use appropriate safety procedures, tools, measurements, graphs and mathematical analyses to describe and investigate natural and designed systems in Earth and physical science contexts.			

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Sept.	Pure substances can be identified by properties which are independent of the sample of the substance and the properties can be explained by a model of matter that is composed of small particles.	8.2.1.1.1 Distinguish between a mixture and a pure substance and use physical properties including color, solubility, density, melting point and boiling point to separate mixtures and identify pure substances.	Matter What chemical properties would make separating Iron from the mixture of iron + sulfur + aluminum possible, and the separation of Iron from a compound like Iron Sulfide impossible? How can the properties of density explain the appearance and function of today's Earth?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Sept.	Substances can undergo physical and chemical changes which may change the properties of the substance but do not change the total mass in a closed system.	2. Substances can undergo physical and chemical changes which may change the properties of the substance but do not change the total mass in a closed system. 8.2.1.2.1	Why can I seal an ice cube in a jar and allow it to melt; heat the water to a vapor and not change the mass of the jar and water?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Sept.	Substances can undergo physical and chemical changes which may change the properties of the substance but do not change the total mass in a closed system.	Distinguish between chemical and physical changes in matter. 8.2.1.2.2	What processes are taking place when water moves from ice to vapor? How do we know we are not making a completely new substance? When we do make something brand new when 2 or more substances combine chemically, what keeps them from changing back to the original substances?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,

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Sept.	Substances can undergo physical and chemical changes which may change the properties of the substance but do not change the total mass in a closed system.	Recognize that acids are compounds whose properties include a sour taste, characteristic color changes with litmus and other acid/base indicators, and the tendency to react with bases to produce a salt and water. 8.2.1.2.4	What makes various food items taste sour vs bitter? How do chemical tests of food products relate to chemical tests of non food product with the same lab results. ex (Lemon juice vs citric acid) and many others?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Oct.	Water, which covers the majority of the Earth's surface, circulates through the crust, oceans and atmosphere in what is known as the water cycle.	Describe how the water cycle distributes materials and purifies water. For example: Dissolved gases in rain can change the chemical composition of substances on Earth/ 8.3.2.3.2	How do the use and abuse of water stores in North American aquifers relate to the last/future ice ages? how do the burning of fossil fuels create chemicals harmful to those who would drink the water. (Hg, Dioxins, acidity, etc)	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Oct.	The sun is the principal external energy source for the Earth.	Explain how heating of the Earth's surface and atmosphere by the sun drives convection within the atmosphere and hydrosphere producing winds, ocean currents and the water cycle, as well as influencing global climate. 8.3.2.1.3	Hypothesize why there would be a rainforest on one side of a mountain and desert on the other side of the same mountain. How do land masses store and distribute water across entire continents? What relationship do surface waters have with subsurface waters?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Oct.	The sun is the principal external energy source for the Earth.	Recognize that oceans have a major effect on global climate because water in the oceans holds a large amount of heat. 8.3.2.1.2	How do warm waters of the equator affect land masses at the top of the earth?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,

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Oct.	Patterns of atmospheric movement influence global climate and local weather.	Analyze changes in wind direction, temperature, humidity and air pressure and relate them to fronts and pressure systems. 8.3.2.2.2	How can rising warm air create a cloud and sinking cold air will not? How can we determine if wind is the movement of air molecules from areas of high pressure to areas of low pressure?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Nov.	The sun is the principal external energy source for the Earth.	Explain how the combination of the Earth's tilted axis and revolution around the sun causes the progression of seasons. 8.3.2.1.1	Why is sunlight not distributed evenly across a round object? How can tilting that object toward or away from a light source affect where the most intense rays of sunlight will strike?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Nov.	Patterns of atmospheric movement influence global climate and local weather.	Describe how the composition and structure of the Earth's atmosphere affects energy absorption, climate, and the distribution of particulates and gases. For example: Certain gases contribute to the greenhouse effect. 8.3.2.2.1	Why is it important to have a planetary greenhouse effect with certain gasses in the atmosphere? Why are too many of those gasses in the atmosphere not good for the overall health of the planet? How does the state of water in the oceans (ice vs water) affect the amount of energy absorbed by the planet?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Nov.	Patterns of atmospheric movement influence global climate and local weather.	Relate global weather patterns to patterns in regional and local weather. 8.3.2.2.3	How do the addition of small local climates combine to equal a larger regional climate? Why is weather not climate? How do city and rural microclimates simulate regional climates?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,

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Dec	The Earth is the third planet from the sun in a system that includes the moon, the sun, seven other planets and their moons, and smaller objects.	Use the predictable motions of the Earth around its own axis and around the sun, and of the moon around the Earth, to explain day length, the phases of the moon, and eclipses. 8.3.3.1.5	Why was the discovery by Copernicus that the earth is not the center of the universe so important to the scientific revolution? How did his discovery change how we look at the regular movements of celestial bodies today? How are the orbits of the moon around the earth, the earth around the sun, the sun around the galactic center, and other galaxies similar?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Dec	Science and engineering operate in the context of society and both influence and are influenced by this context.	Provide examples of how advances in technology have impacted the ways in which people live, work and interact.8.1.3.3.3	How has the internet revolutionized how we share information today compared to how Galileo shared information in the 1500's?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Jan	The Earth is the third planet from the sun in a system that includes the moon, the sun, seven other planets and their moons, and smaller objects.	Recognize that gravitational force exists between any two objects and describe how the masses of the objects and distance between them affect the force.8.3.3.1.3	Lagrange gravity points between the earth and moon, why is this spot never the same spot from one day to the next? Would the same be true for the sun and earth relationship?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Jan	The Earth is the third planet from the sun in a system that includes the moon, the sun, seven other planets and their moons, and smaller objects.	Describe how gravity and inertia keep most objects in the solar system in regular and predictable motion.8.3.3.1.2	If we had inertia without gravity would we still orbit around objects? Gravity without inertia, how would this be any different?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,

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Jan	The Earth is the third planet from the sun in a system that includes the moon, the sun, seven other planets and their moons, and smaller objects.	Compare and contrast the sizes, locations, and compositions of the planets and moons in our solar system. 8.3.3.1.4	Why are all the rock planets so close to the sun and the big puffy gas planets so far from the sun. How come the asteroid belt never formed a planet?...or did it?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Jan	The Earth is the third planet from the sun in a system that includes the moon, the sun, seven other planets and their moons, and smaller objects.	Recognize that the sun is a medium sized star, one of billions of stars in the Milky Way galaxy, and the closest star to Earth. 8.3.3.1.1	How does knowing the speed of light and how parallax works, explain the age of the universe? Mathematically speaking, should we be the only life in the Milky Way galaxy?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Feb	Current and emerging technologies have enabled humans to develop and use models to understand and communicate how natural and designed systems work and interact.	Use maps, satellite images and other data sets to describe patterns and make predictions about local and global systems in Earth science contexts. For example: Use data or satellite images to identify locations of earthquakes and volcanoes, ocean surface temperatures, or weather patterns.8.1.3.4.1	Why and how are the current positions of the continents and the mapped locations of earthquakes and volcanoes relate to one another? Why do the continents appear to be connected at one time? Why can scientists say the distance between continents is never the same from year to year?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Feb	The movement of tectonic plates results from interactions among the lithosphere, mantle and core.	Recognize that the Earth is composed of layers, and describe the properties of the layers, including the lithosphere, mantle and core.8.3.1.1.1	Using what you know about density, where should the densest/least dense material on earth be located? How can mapping and tracking earthquakes tell us about what lies inside the earth.	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,

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Feb	The movement of tectonic plates results from interactions among the lithosphere, mantle and core.	Correlate the distribution of ocean trenches, mid-ocean ridges and mountain ranges to volcanic and seismic activity. 8.3.1.1.2	Can we have volcanoes without having earthquakes? Can we have earthquakes w/o having a volcano? What relationship exists between plate margins, EQs and volcanic activity that occurs there?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Mar	The movement of tectonic plates results from interactions among the lithosphere, mantle and core.	Recognize that major geological events, such as earthquakes, volcanic eruptions and mountain building, result from the slow movement of tectonic plates. 8.3.1.1.3	If there are places where new crust is made, where does the old crust go? What do volcanoes in these areas have to do with recycling of the crust? Are the deep earthquakes that occur there any indication of the recycling subduction process?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Mar	Landforms are the result of the combination of constructive and destructive processes.	Explain how landforms result from the processes of crustal deformation, volcanic eruptions, weathering, erosion and deposition of sediment. 8.3.1.2.1	How do the forces applied to the earths' crust affect the shape of the crust in those areas? Do the wrinkles we see in the crust from space provide evidence of the plate model?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Mar	Waves involve the transfer of energy without the transfer of matter.	Explain how seismic waves transfer energy through the layers of the Earth and across its surface. 8.2.3.1.1	Primary and secondary seismic waves travel at different speeds and through different materials. How do these properties allow us to determine the distance and location of earthquakes?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Mar	Rocks and rock formations indicate evidence of the materials and conditions that produced them.	Classify and identify rocks and minerals using characteristics including, but not limited to, density, hardness and streak for minerals; and texture and composition for rocks. 8.3.1.3.2	What makes any characteristic of a mineral more important or reliable than the next? Is technology an important piece of the puzzle when locating and mining these minerals?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,

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Apr	Pure substances can be identified by properties which are independent of the sample of the substance and the properties can be explained by a model of matter that is composed of small particles.	Use physical properties to distinguish between metals and non-metals. 8.2.1.1.2	How are all of the products and structures we use today a result of the true identification of any one given substance. Why can't we just take any old mineral or rock and get it to do what we need it to do?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Apr	Rocks and rock formations indicate evidence of the materials and conditions that produced them.	Relate rock composition and texture to physical conditions at the time of formation of igneous, sedimentary and metamorphic rock. 8.3.1.3.3	Why do minerals form larger crystals when allowed to cool deeper inside the earth?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Apr	Landforms are the result of the combination of constructive and destructive processes.	Explain the role of weathering, erosion and glacial activity in shaping Minnesota's current landscape. 8.3.1.2.2	What importance does hardness of a mineral play when weathering occurs on a formation? How do the clues left behind from glaciers prove their existence? What great gift have the glaciers left people of North America and Asia that we depend on still today?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
Apr	In order to maintain and improve their existence, humans interact with and influence Earth systems.	Describe how mineral and fossil fuel resources have formed over millions of years, and explain why these resources are finite and non-renewable over human time frames. 8.3.4.1.1	How are the depletion of the world's trees and fossil fuels the same or different when compared to the span of human life times? Have we ever seen a time in our area where all the trees have been harvested only to return in less than one human lifetime?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,

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Apr	Substances can undergo physical and chemical changes which may change the properties of the substance but do not change the total mass in a closed system.	Use the particle model of matter to explain how mass is conserved during physical and chemical changes in a closed system. 8.2.1.2.3	If by shuffling the cards in a full deck of 52 changed the # of cards in the deck, would this be a logical outcome to shuffling? How would the shuffling of a deck of cards be the same or different than the shuffling of atoms in ordinary chemical change?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
May	In order to maintain and improve their existence, humans interact with and influence Earth systems.	Recognize that land and water use practices can affect natural processes and that natural processes interfere and interact with human systems. For example: Levees change the natural flooding process of a river. Another example: Agricultural runoff influences natural systems far from the source. 8.3.4.1.2	How does the application of herbicides and pesticides in China affect the mating results of Beluga whales on the east coast of the USA? How have the changes in chemical use globally resulted in a positive change in natural systems? (bald eagles)	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
May	Water, which covers the majority of the Earth's surface, circulates through the crust, oceans and atmosphere in what is known as the water cycle.	Describe the location, composition and use of major water reservoirs on the Earth, and the transfer of water among them. 8.3.2.3.1	Is water forever? Why is it forever and is not forever, all at the same time? How do the differences in freshwater and seawater explain population centers and ways of using the water available?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,
May	Rocks and rock formations indicate evidence of the materials and conditions that produced them.	Interpret successive layers of sedimentary rocks and their fossils to infer relative ages of rock sequences, past geologic events, changes in environmental conditions, and the appearance and extinction of life forms. 8.3.1.3.1	Is the fossil record our only window into the past? How do technology changes affect our view of our current fossil collection?	Labs, Quizzes, Tests, Group Discussions Worksheets Science Links	Websites, Textbooks, videos,