Eartha	arth and Space K-12 Vertical Alignment Topic Kinder §112.2 1st §112.3 2nd §112.4 3rd §112.5 4th §112.6 5th §112.26 7th §112.27 8th §112.28 Biology §112.41 Physics §112.45 Earth Systems §112.49 Environmental Science §112.50 Aquatic Science §112.47 Astronomy §112.48															
Торіс	Kinder §112.2	1st §112.3	2nd §112.4	3rd §112.5	4th §112.6	5th §112.7	6th §112.26	7th §112.27	8th §112.28	Biology §112.42	IPC §112.44	Chemistry §112.43	Physics §112.45	Earth Systems §112.49	Environmental Science §112.50 Aquatic Science §112.47	Astronomy §112.48
Day and Night	K.9.A identify, describe and predict the patterns of day and night and their observable characteristics;					5.9.A demonstrate that Earth rotates on its axis once approximately every 24 hours and explain how that causes the day/night cycle and the appearance of the Sun moving across the sky, resulting in changes in shadow positions and shapes.										Astro.6.A observe, record, and analyze the apparent movement of the Sun, Moon, and stars and predict sumise and sunset; Astro.9.B predict how changing latikulinal position affects the length of day and night throughout a planet's orbital year;
Observing Objects in the Sky	K.3.B observe, describe and illustrate the Sun, Moon, stars, and objects in the sky such as clouds.		2.9.8 observe objects in the sky using tools such as a telescope and compare how objects in the sky are more visible and can appear different with a tool than with an unaided eye.													Astro.5.A evaluate and communicate how ancient civilizations developed models of the universe using astronomical structures, instruments, and tools such as the astrolabe, gnomons, and charts and how those models influenced society, time keeping, and navigation; Astro.5.C describe and explain the historical origins of the perceived patterns of constellations and the role of constellations and the role of constellations and the role of constellations and the role of constellations such as Ursa Major, Ursa Minor, Orion, Cassiopeia, and constellations along the ecliptic and describe their importance; Astro.10.B calculate the relative light-gathering power of different-sized telescopes to compare telescopes for different applications; of optical, infrared, and radio telescopes, gravitational wave detectors, and other ground- based technology; Astro.10.D analyze the importance and limitations of space telescopes in the collection of astronomical data across the electromartetic soectrum
Seasons	K.10.B observe and describe weather changes from day to day and over seasons;	1.9.A The student is expected to describe and predict the patterns of seasons of the year such as order of occurrence and changes in nature.	F		4.9.A collect and analyze data to identify sequences and predict patterns of change in seasons such as change in temperature and length of daylight;		6.9.A model and illustrate how the tilted Earth revolves around the Sun, causing changes in seasons;									Astro.9.A examine the relationship of a planet's axial tilt to its potential seasons;
			2.9.A describe the Sun as a star that provides light and heat and explain that the Moon reflects the Sun's light;													Astro.12.A identify the approximate mass, size, motion, temperature, structure, and composition of the Sun;

Characteristics of the Sun										Astro.12.B distinguish between nuclear fusion and nuclear fission and identify the source of energy within the Sun as nuclear fusion of hydrogen to helium; Astro. 12.C describe the eleven-year solar cycle and the significance of sunspots; Astro.12.D analyze the origins and effects of space weather, including the solar wind, coronal mass ejections, prominences, flares, and sunspots.
Sun, Earth, and Moon Relationship		3.9.4 construct models and explain the orbits of the Sun, Earth, and Moon in relation to each other;	4.9.8 collect and analyze data to identify sequences and predit patterns of change in the observable appearance of the Moon from Earth.	6.9.8 describe and predict how the positions of the Earth, Sun, and Moon cause daily, spring, and neap cycles of ocean tides due to gravitational forces.	7.9.C analyze the characteristics of Earth that allow life to exist such as the proximity of the Sun, presence of water, and composition of the atmosphere.					Astro.8.A model how the orbit and relative position of the Moon cause lunar phases and predict the timing of moonrise and moonset during each phase; Astro.8.B model how the orbit and relative position of the Moon cause lunar and solar eclipses; Astro.8.C examine and investigate the dynamics of tides using the Sun, Earth, and Moon model. Astro.9.C investigate the relationship between a planet's astil tilt, angle of incidence of sunlight, and concentration of solar energy; Astro.9.D explain the significance of Earth's solstices and equinoxes. Astro.11.D compare the factors essential to life on Earth such as temperature, water, gases, and gravitational and magnetic fields to conditions on other planet's astellites.
		3.9.B identify the order of the planets in Earth's solar system in relation to the Sun.			7.9.A describe the physical properties, locations, and movements of the Sun, planets, moons, meteors, asteroids, comets, Kuiper belt, and Oort cloud;			Earth.5.B identify comets, asteroids, meteoroids, and planets in the solar system and describe how they affect the Earth and Earth's systems;		Astro.6.B observe the movement of planets throughout the year and measure how their positions change relative to the constellations; Astro.7.A demonstrate the use of units of measurement in astronomy, including astronomical units and light years, minutes, and seconds; Astro.7.B model the scale, size, and distances of the Sun, Earth, and Moon system and identify the limitations of physical models; Astro.7.C model the scale, size, and distances of the Sun and the planets in our solar system and identify the limitations of physical models.

Solar System Components Positions and Locations										Astro.11.A relate Newton's law of universal gravitation and Kepler's laws of planetary motion to the formation and motion of the planets and their satellites; Astro.11.B explore and communicate the origins and significance of planets, planetary rings, satellites, asteroids, comets, Oort cloud, and Kuiper belt objects; Astro.11.C compare the planets in terms of orbit, size, composition, rotation, atmosphere, natural satellites, magnetic fields, and geological activity; Astro.13.G illustrate how astronomers use geometric parallax to determine stellar distances and intrinsic luminosities; Astro.13.H describe how stellar distances are determined by comparing apparent brightness and intrinsic luwit relation for variable stars. Astro.15.B evaluate the limits of observational astronomy methods used to formulate the distance ladder; Astro.16.C evaluate the evidence of the existence of habitable zones and potentially habitable planetary bodies in extrasolar planetary systems;
Stars					8.9.A describe the life cycle of stars and compare and classify stars using the Hertzsprung-Russell diagram;			Earth.5A analyze how gravitational condensation of solar nebular gas and dust can lead to the accretion of planetesimals and protoplanets;		Astro.13.A identify the characteristics of main sequence stars, including surface temperature, age, relative size, and composition; Astro.13.B describe and communicate star formation from nebulae to protostars to the development of main sequence stars; Astro.13.C evaluate the relationship between mass and fusion on stellar evolution; Astro.13.D compare how the mass of a main sequence star will determine its end state as a white dwarf, neutron star, or black hole; Astro.13.E describe the use of spectroscopy in obtaining physical data on celestial objects such as temperature, chemical composition, and relative motion:

Galaxies				8.9.B categorize galaxies as spiral, elliptical, and irregular and locate Earth's solar system within the Nilky Way galaxy;			Astro.13.F use the Hertzsprung-Russell diagram to classify stars and plot and examine the life cycle of stars from birth to death; Astro.14.A illustrate the structure and components of our Milky Way galaxy and model the size, location, and movement of our solar system within it; Asro.14. B compare spiral, ellipitcal, irregular, dwarf, and active galaxies; Astro.14.0 describe the Local Group and its relation
Theories of the Universe				8.9.C research and analyze scientific data used as evidence to develop scientific theories to describe the origin of the universe.		Earth.5.C analyze how gravitational condensation of solar nebular gas and dust can lead to the accretion of planetesimals and protoplanets; Earth.7.C construct a model of the geological time scale using relative and absolute dating methods to represent Earth's approximate 4.6- billion-year history;	Astro.14.C develop and use models to explain how galactic evolution occurs through mergers and collisions; Astro.15.A describe and evaluate the historical development of evidence supporting the Big Bang Theory; Astro.15.D describe the current scientific understanding of the evolution of the universe, including estimates for the age of the universe; Astro.15.E describe eurrent scientific hypotheses about the fate of the universe.
Earth's Atmosphere	K.10.C identify evidence that supports the idea that air is all around us and demonstrate that wind is moving air using items such as a windsock, pinwheel, or ribbon.		6.10.A differentiate between the biosphere, hydrosphere, and geosphere and identify components of each system;			Earth.6.8 evaluate the roles of volcanic outgassing and water- bearing comets in developing Earth's atmosphere and hydrosphere; Earth.6.C evaluate the evidence for changes to the chemical composition of arth's atmosphere prior to the introduction of oxygen; Earth.6.C describe how the production of oxygen by photosynthesis affected the development of the atmosphere, hydrosphere, geosphere, and biosphere. Earth.1.B describe how the production of oxygen by photosynthesis affected the development of the atmosphere is chemically and thermally stratified and how solar radiation interacts with the layers to cause the ozone layer, the jet stream, Hadley and Ferrel cells, and other atmosphere;	ter, t

Theories of Origins										Earth.6.D evaluate scientific hypotheses for the origin of life through abiotic chemical processes;			
Rocks	k.10.A describe and classify rocks by the observable properties of size, shape, color, and texture;			4.11.C determine the physical properties of rocks that allow Earth's natural resources to be stored there.	5.10.B model and describe the processes that led to the formation of sedimentary rocks and fossil fuels;	6.10.C describe how metamorphic, igneous, and sedimentary rocks form and change through geologic processes in the rock cycle.				Earth. 7. E describe how evidence of biozones and faunal succession in rock layers reveal information about the environment at the time those rocks were deposited and the dynamic nature of the Earth. Earth. 7. A describe the development of multiple radiometric dating methods and analyze their precision, reliability, and limitations in calculating the ages of igneous rocks from Earth, the Moon, and meteorites:			
Soil		1.10.A investigate and document the properties of particle size, shape, texture, and color and the components of different types of soils such as topsoil, clay, and sand;	3.10.B investigate and explain how soils such as sand and clay are formed by weathering of rock and by decomposition of plant and animal remains; and								Env.10.A identify sources of emissions in air, soil, and water, including point and nonpoint sources;		
		1.10.C compare the properties of puddles, ponds, streams, rivers, lakes, and oceans, including color, clarity, size, shape, and whether it is freshwater or saltwater;		4.10.A describe and illustrate the continuous movement of water above and on the surface of Earth through the water cycle and explain the role of the Sun as a major source of energy in this process;	5.10.A explain how the Sun and the ocean interact in the water cycle and affect weather;		7.11.8 describe human dependence and influence on ocean systems and explain how human activities impact these systems.			Earth.9.D evaluate how weather and human activity affect the location, quality, and supply of available freshwater resources.	Env.6.8 relate how water sources, management, and conservation affect water uses and quality;	Aqua.10.C analyze water quantity and quality in a local watershed or aquifer;	
							7.11.A analyze the beneficial and harmful influences of human activity on groundwater and surface water in a watershed;			Earth.10.A describe how the composition and structure of the oceans leads to thermohaline circulation and its periodicity; Earth.9.B investigate and	Env.10.A identify sources of emissions in air, soil, and water, including point and nonpoint sources;	Aqua.12.A differentiate among freshwater, brackish, and marine ecosystems; Aqua.12.B identify the	
Hydrosphere										model how surface water and ground water change the lithosphere through chemical and physical weathering and how they serve as valuable natural resources; Earth.10.B model and		major properties and components of different marine and freshwater life zones. Aqua.10.A identify sources	
										explain how changes to the composition, structure, and circulation of deep oceans affect thermohaline circulation using data on energy flow, ocean basin structure, and changes in		of water in a watershed, including rainfall, groundwater, and surface water;	

	Weather		1.10.D describe and record observable characteristics of weather, including hor or cold, clear or cold, clear or cold, clear or cold, clam or windy, and rainy or icy, and explain the impact of weather on daily choices.	2.10.8 measure, record, and graph weather information, including temperature and precipitation;	3.10.A compare and describe day-to-day weather in different locations at the same time, including air temperature, wind direction, and precipitation;	4.10.C differentiate between weather and climate.			8.10.B identify global patterns of atmospheric movement and how they influence local weather; 8.10.A describe how energy from the Sun, hydrosphere, and atmosphere interact and influence weather and climate;			Earth.10.C analyze how global surface ocean circulation is the result of wind, tides, the Coriolis effect, water density differences, and the shape of the ocean basins. Earth.11.F explain how the transfer of thermal energy among the hydrosphere, lithosphere and atmosphere influences weather; Earth.11.G describe how changing surface-ocean conditions, including EI Nino-Southern Oscillation, affect global weather and climate patterns.	Env.9.D describe how temperature inversions have short-term and long-term effects including El Niño and La Niña oscillations, ice cap and glacial melting, and changes in ocean surface temperatures; and	Aqua.10.B identify factors that contribute to how water flows through a watershed;	
w	eather Events			2.10. investigate different types of severe weather events such as a hurricane, tornado, or flood and explain that some events are more likely than others in a given region.					8.10C describe the interactions between ocean currents and air masses that produce tropical cyclones, including typhoons and hurricanes.			Earth.12.B analyze the impact on humans of naturally occurring extreme weather events such as flooding, hurricanes, tornadoes, and thunderstorms; Earth.12.C analyze the natural and anthropogenic factors that affect the severity and frequency of extrem weather events and the hazards associated with these events; Earth.12.F analyze the natural and anthropogenic factors that affect the severity and frequency of extrem weather events and the hazards associated with these events;	- -	Aqua.9.8 examine the interrelationships between aquatic systems and climate and weather, including E I wiño and La Niña, currents, and hurricanes;	
	Resources	K.11.A observe and generate examples of practical uses for rocks, soil, and water.	1.11.A identify and describe how plants, animals, and humans use rocks, soil, and water;	2.11.A distinguish between natural and manmade resources;	3.11.A explore and explain how humans use natural resources such as in construction, in agriculture, in transportation, and to make products;	4.11.A identify and explain advantages and disadvantages of using Earth's renewable and nonrenewable natural resources such as wind, water, sunlight, plants, animals, coal, oil, and natural gas;	5.10.8 model and describe the processes that led to the formation of sedimentary rocks and fossil fuels;			IPC.6.G evaluate evidence from multiple sources to critique the advantages and disadvantages of various renewable and nonrenewable energy sources and their impact on society and the environment.		Earth. 12. E predict how human use of Texas's naturally occurring resources such as fossial fuels, mimerals, soil, solar energy, and wind energy directly and indirectly changes the cycling of matter and energy through Earth's systems;	Env.6.C document the use and conservation of both renewable and non-renewable resources as they pertain to sustainability;	Aqua. 10.D describe human uses of fresh water and how human freshwater use competes with that of other organisms.	
			1.11.B explain why water conservation is important;	2.11.8 describe how human impact can be limited by making choices to conserve and properly dispose of materials such as reducing use of, reusing, or recycling paper, plastic, and metal.	3.11.8 explain why the conservation of natural resources is important; and	4.11.B explain the critical role of energy resources to modern life and how conservation, disposal, and recycling of natural resources impact the environment;	5.11.A design and explain solutions such as conservation, recycling, or proper disposal to minimize environmental impact of the use of natural resources	6.11.A research and describe why resource management is important in reducing global energy, poverty, mainutrition, and air and water pollution;				Earth.13.A analyze the policies related to resources from discovery to disposal, including economics, health, technological advances, resource type, concentration and location, waste disposal and recycling, mitigation efforts, and environmental impacts;	Env.6.F evaluate the impact of waste management methods such as reduction, reuse, recycling, upcycling, and composting on resource availability in the local environment.		

Resource Management	1.11.C describe ways to conserve water such as turning off the faucet when brushing teeth and protein natural sources of water such as keeping trash out of bodies of water.	3.11. Lidentify ways to conserve natural resources through reducing, reusing, or recycling.	4 10 B model and describe 5 10 C model and identify	6.11.8 explain how conservation, increased efficiency, and technology can help manage air, water, soil, and energy resources.		Earth 1.3.8 expl and Texas-base that involve the exploration, us regulation, and protection of Ear resources.	re global Env.6.A compare and contrast (careers land use and management methods and how they affect action, land attributes such as ferility, disposal, productivity, economic value, and ecological stability Env.12.A evaluate cost-benefit trade-offs of commercial activities such as municipal development, food production, deforestation, over-harvesting, mining, and use of renewable and non-renewable energy sources; Env.12.B evaluate the economic impacts of individual actions on the environment such as overbuilding, habitat destruction, poaching, and improper waste disposal; Env.12.C analyze how ethical beliefs influence environmental scientific and engineering practices such as methods for food production, water distribution, energy production, and the extraction of minerals; the	
Earth's Changing Surface	1.10.6 investigate and describe how water can move rock and soil particles from one place to another;	2.10.4 Investigate and describe how wind and describe how wind and set of the set of the set of the set particles across the wind blowing sand into landslides. dunes on a beach or a river carrying rocks as it flows;	4. JLB. model and lescribe in slow changes to Earth's surface caused by weathering, erosion, and deposition from water, wind, and ice;	7.10.4 describe int evidence that supports that Earth has changed over time, including fos evidence, plate tectonics, and superposition;	3 h sin l l l l l l l l l l l l l	Earth 3.4 mole processes of m wasting, erosio deposition by wind, ice, glacia gravity, and vol constantly resh Earth 3 surface; Earth 12.4 evai impact on hum natural changes systems such as earthquakes, ts and volcanic er Earth 3.4 interp surface feature: variety of meth as satellite imay aerial photogra topographic an maps using app technologies;	the Aqua.1LD describe how so errosion and deposition in river systems lead to a terr, formation of geologic ion, features; formation of geologic features; formation of geologic in features; featur	
Climate			4.10.C differentiate between weather and climate.		B.10.A describe how IPC.8.D construct an communicate an evidence-based atmosphere interact and influence weather and climate; evidence-based explanation of the end-products chemical reactions such as those that may result in degradation of wate soil, air quality, and global climate change volcanic eruptions, meteor impacts, abrupt changes in ocean currents, and the release and absorption of greenhouse gases influence climate;	t Earth.11.A anal energy transfer Milankovitch cy albedo, and diff atmospheric an absorption are mechanisms of Earth.11.G desc changing surfac conditions, incl. Niño-Southern Oscillation, affe weather and di patterns.	ze how Env.10.£ distinguish between the through les, varming and ozone depletion, varming and ozone depletion, surface (hemicals involved, the atmospheric layer, the environmental effects, the human health effects, and the relevant wavelengths on the electromagnetic spectrum (IR and UV). ibe how Env.9.D describe how temperature inversions have tinding El short-term and long-term effects, including El Niño and La Niña t global oscillations, ice cap and glacial meting, and changes in ocean surface temperatures; and	

		8.11.B use scientific evidence to describe how human activities, including the release of greenhouse gases, deforestation, and urbanization, can influence climate;	Earth.11.D evaluate how the combination of multiple feedback loops alter global climate; and analyze evidence for climate changes over Earth.11.E investigate and analyze evidence for climate changes over Earth's historical records, and measured greenhouse gas levels; Earth.11.C model how greenhouse gases trap thermal energy near Earth's historica;
Earth's Layers	6.0.0 m describe t Earth, ind inner core mantie, a	nodel and the layers of cluding the re, outer core, and crust;	Earth-7.B apply relative dating methods, principles of stratigraphy, and index fossils to determine the chronological order of rock layers; Earth.8.D describe how heat and rock composition affect density within Earth's interior and how density influences the development and motion of Earth's tectonic plates; Earth.6.A describe how impact accretion, gravitational compression, radioactive decay, and cooling differentiated proto- Earth nto layers; Earth.8.B develop a model of the physical, mechanical, and chemical composition of Earth's layers using evidence from Earth's magnetic field, the composition of meteorites, and seismic waves;
Plate Tectonics		7.10.8 describe how plate tectorisc scuese ocean basin formation, earthquakes, mountain building, and volcanic eruptions, including super volcances and hot spots.	Earth.8.E explain how plate tectonics accounts for geologic processes, including sea floor spreading and subduction, and features, including ocean ridges, rift valleys, earthquakes, volcances, mountain ranges, hot spots, and hydrothermal vents; Earth.8.C investigate how new conceptual interpretations of data and innovative geophysical technologies led to the current theory of plate tectonics; Earth.8.F calculate the motion history of tectonic plates using equations relating rate, time, and distance to predict future motions, locations, and resulting geologic features;

											E ເຊ ເຊ c c c c c c c c c c c c c c c c c	arth.8.C distinguish the bocation, type, and lealtive motion of onvergent, divergent, divergent, divergent, divergent, divergent, divergent, divergent, divergent, divergent, sitribution of arthquakes and olocances; arth.8.H evaluate the ole of plate tectonics divergent olobal changes in Earth's biosystems such as ontinental buildup, faciation, sea level uctuations, and climate hance		
Study of Astronomy												under		Astro.5.B research and evaluate the contributions of scientistis, including Ptolemy, Copernicus, Tycho Brahe, Kepler, Gallieo, and Newton, as astronomy progressed from a geocentric model; Astro.16.E examine and describe current developments and discoveries in astronomy; Astro.16.F explore and explain careers that involve astronomy, space exploration, and the technologies developed through them. Astro.6.D understand the difference between astronomy astrology, the reasons for their historical conflation, and their eventual separation.
Classification of Celestial Objects														Astro.10.A investigate the use of black body radiation curves and emission, absorption, and continuous spectra in the identification and classification of celestial objects;
Dark Matter and Energy														Astro.14.E evaluate the indirect evidence for the existence of dark matter. Astro.15.C evaluate the indirect evidence for the existence of dark energy;
Space Exploration														Astro.16.A describe and communicate the historical development of human space flight and its challenges; Astro.16.8 describe and communicate the uses and challenges of robotic space flight; Astro.16.D evaluate the
Human Impact on Astronomy														impact on astronomy from light pollution, radio interference, and space debris;
Кеу	SE containing blue tex	t aligns with more the	an one topic. The black	text is relevant to the to	pic in that row.									
						Co	pyright © Texas Educati	on Agency, 2022. All rights	reserved.					