



**Program Transfer Goals**

- Ask questions, recognize and define problems, and propose solutions.
- Safely and ethically collect, analyze, and evaluate appropriate data.
- Utilize (create/analyze) models to make predictions and understand the world around them.
- Make valid claims and informed decisions based on scientific evidence.
- Effectively communicate scientific principles and reasoning to a target audience.

**PACING**

First Nine Weeks	Second Nine Weeks	Third Nine Weeks	Fourth Nine Weeks
Units 1-3	Units 4-5	Units 5-6	Units 6-7

**Assurances for a Guaranteed and Viable Curriculum**

Adherence to this scope and sequence affords every member of the learning community clarity on the knowledge and skills on which each learner should demonstrate proficiency. In order to deliver a guaranteed and viable curriculum, our team commits to and ensures the following understandings:

**Shared Accountability: Responding to the Needs of All Learners**

- High levels of learning for all students.
- The district and course formative assessments aligned to the standards for this course support educators and learners in monitoring academic achievement and leveraging interventions.

**Shared Understanding: Curriculum Design**

- The district curriculum design weaves together the elements of content, skills and assessments in order to adhere to curriculum design at the macro and micro level, ensuring vertical alignment.
- The district curriculum incorporates standards, scope and sequence, enduring understandings, essential questions, performance assessments, and recommended resources.

**Interdependence: Curriculum Units**

Members of the learning community utilize the curriculum units, plan collaboratively, and reflect on results for continuous improvement.

The district curriculum units may be found: <http://tinyurl.com/Coppell-Curriculum>

## UNIT 1: EARTH AS A COMPLEX SYSTEM

TIMELINE: 3-4 WEEKS

**Unit Summary:** *Earth is a complex system made up of multiple smaller systems that work together as a complex whole.*

### Transfer Goals:

- *Ask questions, recognize and define problems, and propose solutions.*
- *Safely and ethically collect, analyze, and evaluate appropriate data.*
- *Utilize (create/analyze) models to make predictions and understand the world around them.*
- *Make valid claims and informed decisions based on scientific evidence.*
- *Effectively communicate scientific principles and reasoning to a target audience.*

*Students will know...*

- *Earth is a complex system made up of components that work together to recycle energy and matter*
- *Every change in one component of a closed system will change every other component of the system*
- *Energy cannot be created or destroyed– only moved between one place and another place, between objects and/or fields, or between systems*
- *Humans, as part of the biosphere, have an impact, on every other Earth System component, either positive or negative*
- *There is no such thing as “away” in a closed system such as Earth*

*Students will be skilled at...*

- *Analyzing geoscience data to make the claim that one change to Earth’s surface can create feedbacks that cause changes to other Earth systems*
- *Developing a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere*

## UNIT 2: COSMOLOGY

TIMELINE: 1-2 WEEKS

**Unit Summary:** The current working theory of the origin of the universe is the Big Bang

### Transfer Goals:

- *Ask questions, recognize and define problems, and propose solutions.*
- *Safely and ethically collect, analyze, and evaluate appropriate data.*
- *Utilize (create/analyze) models to make predictions and understand the world around them.*
- *Make valid claims and informed decisions based on scientific evidence.*
- *Effectively communicate scientific principles and reasoning to a target audience.*

*Students will know...*

- *Science assumes the universe is a vast single system in which basic laws are consistent*
- *The Big Bang theory is supported by observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe*
- *Models, mechanisms, and explanations collectively serve as tools in the development of the Big Bang theory*

*Students will be skilled at...*

- *Constructing an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.*
- *Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes*
- *Represent data on two quantitative variables on a scatter plot, and describe how those variables are related*

### **UNIT 3: STARS**

**TIMELINE: 2 WEEKS**

**Unit Summary:** Massive stars explode as supernovae when their fuel for fusion is depleted, dispersing heavy elements created in their cores into space

**Transfer Goal:**

- *Ask questions, recognize and define problems, and propose solutions.*
- *Safely and ethically collect, analyze, and evaluate appropriate data.*
- *Utilize (create/analyze) models to make predictions and understand the world around them.*
- *Make valid claims and informed decisions based on scientific evidence.*
- *Effectively communicate scientific principles and reasoning to a target audience.*

*Students will know...*

- *The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years*
- *The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth*
- *Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode*
- *Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation*

*Students will be skilled at...*

- *Developing a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.*
- *Communicating scientific ideas about the way stars, over their life cycle, produce elements.*
- *Represent data on two quantitative variables on a graph, and describe how those variables are related*

### **UNIT 4: SOLAR SYSTEMS**

**TIMELINE: 2 WEEKS**

**Unit Summary:** The Solar System was originated from the gravitational condensation, and subsequent accretion, of solar gas and dust from the Solar Nebula

**Transfer Goals:**

- *Ask questions, recognize and define problems, and propose solutions.*
- *Safely and ethically collect, analyze, and evaluate appropriate data.*
- *Utilize (create/analyze) models to make predictions and understand the world around them.*
- *Make valid claims and informed decisions based on scientific evidence.*

- *Effectively communicate scientific principles and reasoning to a target audience.*

*Students will know...*

*Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system*

*Students will be skilled at...*

- *Applying scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.*
- *Using mathematical or computational representations to predict the motion of orbiting objects in the solar system.*

## **UNIT 5: ENERGY TRANSFER AS A DRIVING FORCE OF EARTH'S SYSTEMS**

**TIMELINE: 9 WEEKS**

**Unit Summary:** Heat transfer occurs through Earth's subsystems by radiation, convection, and conduction and is responsible for driving plate tectonics, volcanism, ocean circulation, weather, and climate.

**Transfer Goals:**

- *Ask questions, recognize and define problems, and propose solutions.*
- *Safely and ethically collect, analyze, and evaluate appropriate data.*
- *Utilize (create/analyze) models to make predictions and understand the world around them.*
- *Make valid claims and informed decisions based on scientific evidence.*
- *Effectively communicate scientific principles and reasoning to a target audience.*

*Students will know...*

- *The earth is made up of several layers, separated by density 4.5 million years ago*
- *Earthquakes are caused by changes underground driven by energy derived from the core. Hydraulic fracturing may be leading to localized earthquakes*
- *Earth's crust is made up of several plates that interact in various ways, producing topographic features such as mountain ranges, volcanic island chains, and deep ocean trenches, and result in earthquakes, and volcanoes*
- *Predictions can be made where natural disasters such as earthquakes, tsunamis, and volcanoes will occur based on the movement of the plates*

*Students will be skilled at...*

- *Developing a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.*
- *Developing a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.*
- *Evaluating evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.*

## **UNIT 6: HISTORY OF EARTH**

**TIMELINE: 9 WEEKS**

**Transfer Goals:**

- *Ask questions, recognize and define problems, and propose solutions.*
- *Safely and ethically collect, analyze, and evaluate appropriate data.*
- *Utilize (create/analyze) models to make predictions and understand the world around them.*
- *Make valid claims and informed decisions based on scientific evidence.*
- *Effectively communicate scientific principles and reasoning to a target audience.*

*Students will know...*

- *Earth changes both gradually over vast periods of time, and through catastrophic events that occur suddenly and violently.*
- *Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.*

*Students will be skilled at...*

- *Constructing an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.*
- *Planning and conducting an investigation of the properties of water and its effects on Earth materials and surface processes.*

## **UNIT 7: WEATHER AND CLIMATE**

**TIMELINE: 9 WEEKS**

### **Transfer Goals:**

- *Ask questions, recognize and define problems, and propose solutions.*
- *Safely and ethically collect, analyze, and evaluate appropriate data.*
- *Utilize (create/analyze) models to make predictions and understand the world around them.*
- *Make valid claims and informed decisions based on scientific evidence.*
- *Effectively communicate scientific principles and reasoning to a target audience.*

*Students will know...*

- *Earth's atmosphere acts as a system that absorbs and distributes matter and energy.*
- *Earth's oceans act as a system that absorbs and distributes matter and energy.*
- *The movement and circulation of the ocean is tied very closely to the movement and circulation of the atmosphere due to the uneven distribution of available solar energy with latitude.*

*Students will be skilled at...*

- *Using a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.*
- *Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.*
- *Constructing an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.*

## UNIT 8: HABITABILITY

TIMELINE: 9 WEEKS

### Transfer Goals:

- *Ask questions, recognize and define problems, and propose solutions.*
- *Safely and ethically collect, analyze, and evaluate appropriate data.*
- *Utilize (create/analyze) models to make predictions and understand the world around them.*
- *Make valid claims and informed decisions based on scientific evidence.*
- *Effectively communicate scientific principles and reasoning to a target audience.*

### Students will know...

- *Earth's atmosphere has been evolving for the past 4+ billion years. Today, anthropogenic atmospheric changes are increasing the overall temperature of the globe by enhancing the greenhouse effect.*
- *Earth is currently being altered at an unprecedented rate by human activity.*
- *Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.*
- *Many organisms will not be able to adapt quickly enough to rapid increase in temperature and will go extinct.*
- *Earth's global ocean has been evolving for the past 4+ billion years. Today, anthropogenic atmospheric pollution and pollution from land runoff are increasing the acidity of the global ocean and causing dead zones. Many organisms will not be able to adapt quickly enough to these rapid changes and will go extinct.*

### Students will be skilled at...

- *Using a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.*
- *Creating a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.*
- *Evaluating or refine a technological solution that reduces impacts of human activities on natural systems.*
- *Evaluating competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.*