Davison Community Schools
ADVISORY CURRICULUM COUNCIL
Phase II, *April 2018*

Course: 8th Grade Earth Science

Phase I: Course Essential Questions

1. What is Earth's place in the Universe and how has it changed throughout time?
2. How do Earth's processes affect Earth?
3. How do human activities affect Earth?

Phase II Curriculum

Unit: Earth's Place in the Universe

Essential Questions:	**Essential Understanding:**
● What makes up our solar system? ● How can models show and describe the Earth's place in the Universe? ● How can the motion of the Earth explain seasons and eclipses? ● How do we know that Earth and life on Earth have changed through time?	● The Earth has a place in relation to the solar system, Milky Way galaxy, and universe. ● Models of the solar system explain astronomical and other observations of the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. ● Instruments and technologies allow us to explore the objects in our solar system and obtain the data that support the theories that explain the formation and evolution of the universe.

Curriculum Standards- DOK noted where applicable with Standards	
Students who demonstrate understanding can:	
MS-ESS1-1.	**Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.**
MS-ESS1-2.	**Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.**
MS-ESS1-3.	**Analyze and interpret data to determine scale properties of objects in the solar system.**
MS-ESS1-4.	**Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.**
MS-ETS1-1	**Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.**
MS-ETS1-2	**Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.**
MS-ETS1-3	**Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.**
MS-ETS1-4	**Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.**

Knowledge/Content **I Know** …(includes academic vocabulary)	**Skills/Processes** **I Can** …
● Examples of models can be physical, graphical, or conceptual. ● Gravity is the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. ● The similarities and differences among solar system objects. ● Rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. ● The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. ● Solution need to be tested, and then modified on the basis of the test results, in order to improve it. ● Use the systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. ● Parts of different solutions can be combined to create a solution that is better than any of its predecessors. ● Models of all kinds are important for testing solutions. ● Identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process. ● Testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. ● Models can be used to demonstrate understanding of our Earth's place in the Universe. ● Gravity plays a role in the motions within galaxies and the solar system. ● Academic Vocabulary: milky way, gravity, solar system, relative dating/fossil record, strata	● explain how gravity is a force of attraction between two objects dependent upon distance and mass ● explain gravity is the force that keeps the solar system and Milky Way galaxy together ● use a model to show the motion of the sun, moon, and stars ● explain the contents of the solar system ● use a model to demonstrate a solar and lunar eclipse ● use a model to demonstrate the cause of the seasons is due to unequal heating of Earth's surface ● explain how the solar system formed from a nebula of dust and gas ● use the geologic time scale to show Earth's history ● use rock strata and the fossil record to provide relative dates and explain major events in Earth's history ● create and/or carefully follow steps of a lab to ensure desired results ● evaluate my results and recommend/make changes for improvement ● identify possible lab errors ● create or use a model to help solve a problem ● self and peer evaluate my results to identify areas of strengths and weaknesses ● present my findings in multiple formats (verbal, written, models, illustrations, etc…)

Phase II Curriculum
Unit: Earth's Systems

Essential Questions:	Essential Understanding:
● How does the rock cycle work? ● How do earth's processes alter Earth's surface? ● How do tectonic plate motions reveal Earth's history? ● How do the materials in and on Earth's crust change over time?	● Different processes create different types of rocks. ● Processes that change earth's surface can be slow (formation of mountains, lake basins, etc..) or fast (landslides, earthquakes, etc…) and can cause catastrophic events. ● Fossils and surface features reveal Earth's history. ● Earth's surface has changed over time.

Curriculum Standards- DOK noted where applicable with Standards

Students who demonstrate understanding can:

MS-ESS2-1.	**Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.**
MS-ESS2-2.	**Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.**
MS-ESS2-3.	**Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.**
MS-ETS1-1.	**Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.**
MS-ETS1-2	**Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.**
MS-ETS1-3	**Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.**
MS-ETS1-4	**Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.**

Knowledge/Content **I Know** …(includes academic vocabulary)	**Skills/Processes** **I Can** …
● The processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials. ● Processes that change Earth's surface can be large/small and/or fast/slow. ● Similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches) provide evidence of Earth's past. ● The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. ● A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. ● Use the systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. ● Models of all kinds are important for testing solutions. ● Identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process. ● Testing the most promising solutions and modifying what is proposed on the basis of the test results leads to refinement and ultimately to an optimal solution. ● Processes include plate tectonic movement, weathering, erosion, deposition, compaction, cementation, melting/cooling, etc… ● Academic Vocabulary: crystallization, weathering, deformation, deposition, tectonic plates, trenches, divergent, convergent, transform, subduction zone	● explain how rocks form from minerals and other rocks ● draw the rock cycle ● identify the sources of earth's energy as the sun and earth's hot interior ● give examples of the changes of Earth's features based on the strength and speed of the energy flow ● explain how Earth recycles matter and what feature(s) are created at those points. ● identify ways scientists know about Earth's history and its future such as by studying seismic waves, rocks, and geographical phenomena such as volcanic eruptions ● explain the processes that cause different types of Earth features from tectonic plate movement ● explain the movement of the tectonic plates ● explain the causes of tectonic plate movement ● create and/or carefully follow steps of a lab to ensure desired results ● evaluate my results and recommend/make changes for improvement ● recognize that human error has an effect on lab results ● create or use a model to help solve a problem ● self and peer evaluate results to identify areas of strengths and weaknesses ● present findings in multiple formats (verbal, written, models, illustrations, etc…)

Phase II Curriculum Unit: Human Impact	
Essential Questions: ● How is the availability of needed natural resources related to naturally occurring processes? ● How can natural hazards be predicted? ● How do human activities affect Earth systems? ● How do we know our global climate is changing?	**Essential Understanding:** ● There are uneven distributions of Earth's mineral, energy, and groundwater resources as a result of past and current geoscience processes. ● There are many ways to monitor and predict future events. including: analyzing patterns, cause and effect relationships, stability of events, and change of events. ● Human uses of land, energy, mineral, and water resources impact Earth's systems in multiple ways. ● Many factors have caused the rise of global temperatures in the past century.

Curriculum Standards- DOK noted where applicable with Standards	
Students who demonstrate understanding can:	
MS-ESS3-1.	Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
MS-ESS3-2.	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
MS-ESS3-3.	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
MS-ESS3-4.	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
MS-ESS3-5.	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Knowledge/Content **I Know** …(includes academic vocabulary)	**Skills/Processes** **I Can** …
● Earth has renewable and non-renewable resources. ● Humans have a great impact on Earth and Earth's systems. ● Possible solutions to help reduce negative human impact on the Earth. ● Some natural hazards (volcanic eruptions, severe weather, etc...)can be predictable, but others (earthquakes, landslides, etc...)	● define and name renewable and non-renewable resources ● give examples of how Earth's processes create an uneven distribution of resources ● define and explain BMP's (Best Management Practices) and other ways humans reduce harmful effects on the Earth ● use data from past events on Earth to make predictions for future events

occur suddenly and without notice, and thus are not yet predictable. ● What types of data can be collected to make predictions (locations, magnitudes, frequencies, etc…) and how to prevent further harm/casualties (shelters, track storms/fires with satellites, etc…). ● Know how human population and consumption rates affect earth's resources. ● Human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity) causing the rise in global temperatures. ● The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. ● A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. ● Use the systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. ● Parts of different solutions can be combined to create a solution that is better than any of its predecessors. ● Models of all kinds are important for testing solutions. ● Identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process. ● Testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. ● Academic Vocabulary: renewable energy, nonrenewable energy, climate change, global warming, fossil fuels, atmosphere, biosphere, geosphere, hydrosphere, greenhouse effect, BMP (best management practices)	● explain ways in which humans prepare for future Earth catastrophes ● explain how the human population rates have an effect on Earth's resources ● give examples of human activities that cause a rise in global temperatures ● define global warming ● explain the greenhouse effect and identify factors in increasing greenhouse gases ● give examples of natural processes that increase global temperatures ● explain how human activity impacts all of Earth's spheres (atmosphere, biosphere, hydrosphere, and geosphere) ● identify ways that humans may disrupt the biosphere (non-native species, plant/animal extinction, etc…) ● give examples of changes to Earth's environments that may cause positive or negative impacts on living things ● create and/or carefully follow steps of a lab to ensure desired results ● evaluate my results and recommend/make changes for improvement ● recognize that human error has an effect on lab results ● create or use a model to help solve a problem ● self and peer evaluate my results to identify areas of strengths and weaknesses ● present my findings in multiple formats (verbal, written, models, illustrations, etc…)

Phase II Curriculum Unit: Waves	
Essential Questions: ● What are the characteristics of wave properties? ● What are the most reliable ways to encode and transmit information? ● How can I use mathematical representations and models to describe waves?	**Essential Understanding:** ● Waves have many properties and characteristics. ● Waves interact with matter and show various characteristic properties and behaviors. ● Models, mathematical thinking, evaluation, and communication of information are all processes used to demonstrate understanding of waves.
Curriculum Standards- DOK noted where applicable with Standards	

Students who demonstrate understanding can:

MS-PS4-1. **Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.**

MS-PS4-2. **Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.**

MS-PS4-3. **Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.**

MS-ETS1-1 **Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.**

MS-ETS1-2 **Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.**

MS-ETS1-3 **Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.**

MS-ETS1-4 **Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.**

Knowledge/Content **I Know** …(includes academic vocabulary)	**Skills/Processes** **I Can** …
● Describe waves based on their properties. ● Model light and mechanical waves. ● That waves can be used for communication purposes (using fiber optic cable to transmit light pulses, radio wave pulses in wifi devices, and conversion of stored binary patterns to make sound or text on a computer screen.] ***Assessment does not include the specific mechanism of any given device.* ● The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful.	● explain the difference between wavelength, frequency, and amplitude ● explain that sound requires a medium to transmit ● explain that when light hits an object, it can be reflected, absorbed, or transmitted ● explain that light travels in a straight line except when it refracts due to varying transparent materials ● use a wave model for explaining brightness, color and refraction of light ● explain that light waves do not need a medium to transmit

● A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. ● Use the systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. ● Parts of different solutions can be combined to create a solution that is better than any of its predecessors. ● Models of all kinds are important for testing solutions. ● Identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process. ● Testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. ● Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. ● Describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. ● Waves are reflected, absorbed, or transmitted through various materials. ● Waves send digital information. ● Digitized signals are a more reliable way to encode and transmit information than analog signals. ● Academic Vocabulary: frequency, amplitude, wavelength	● explain why digital signals are superior to transmitting information than analog ● create and/or carefully follow steps of a lab to ensure desired results ● evaluate my results and recommend/make changes for improvement ● recognize that human error has an effect on lab results ● create or use a model to help solve a problem. ● self and peer evaluate my results to identify areas of strengths and weaknesses ● present my findings in multiple formats (verbal, written, models, illustrations, etc…)