Boone County Integrated Science Curriculum Map (DRAFT)

| **Unit 1, Electricity, Magnetism and Communication** | **Duration**: |
|---|---|

*Key Essential Questions:*

- How are electricity and magnetism related?
- How do I apply electricity and magnetism to better communicate?

*Transfer Goals:*
*Students will be able to independently use their learning to*\

- Use evidence from planning and conducting an investigation to demonstrate the existence of a cause and effect relationship {observed between magnetic and electrical forces}.
- Develop and use a model to illustrate cause and effect relationships {between electric and magnetic forces}.
- Evaluate the relative merits and reliability of digital and analog communication systems.
- Communicate technical information about how a phenomenon [wave behavior] is useful [in energy and information transfer].

**Performance Expectation**

**HS-PS2-5.** Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

**HS-PS3-5.**Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

**HS-PS4-2.** Evaluate questions about the advantages of using a digital transmission and storage of information

**HS-PS4-5.** Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.*

Notes:
Learning Progression Bundles A and B are designed to be interchangeable in order to accommodate the schools on block schedule. Bundles A and B may be switched in order to align the life science content with more compatible weather for performing outdoor investigations in either the spring or fall semesters. For example, a school with a block schedule may decide to teach the bundles in order (Ecology then Energy, Forces Earth) in the fall but reverse the bundle order in the spring and teach Energy, Forces, Earth before Ecology in the spring to give students project-based learning and inquiry activities outside when weather allows.

The introduction of HS-PS3-5 would be cursory, looking at the interactions between charged particles, that the fields are combined but at right angles, electric field does have an effect on the magnetic field and vice versa. The remainder of the concepts included in this performance expectation would be included in B.1

| **Learning Progression Bundle A: Unit A.1 Interdependent Relationships in Ecosystem** | **Duration**: |
|---|---|
| *Key Essential Questions:*<br><br>● How and why do living organisms interact with others and their environments?<br>● How do organisms interact with living and nonliving environments to obtain matter and energy? | |
| *Transfer Goals:*<br>*Students will be able to use their learning to*<br><br>● Use models to illustrate and explain [chemical processes and energy transformations in Earth's systems.]<br>● Use mathematical representations (tables, chart, graphs) to explain a phenomenon dependent on scale (size, time, energy)<br>● Evaluate accepted explanations of how (ecosystems change and ecosystems) achieve stability. | |
| **Performance Expectation** | |
| **HS-LS1-5.** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. **(see note)** | |
| **HS-LS1-7.** Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. | |
| **HS-LS2-1.** Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. | |
| **HS-LS2-2.** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. | |
| **HS-LS2-6.** Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. | |
| **HS-LS2-5.** Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. **(see note)** | |
| Notes: While the basic foundation of photosynthesis **(HS-LS1-5)** are included in this unit, the concept is explored in greater complexity in course 2, Biology as well. Some aspects of the cycling of matter **(HS-LS2-5)** within an ecosystem might also be shared with Biology. | |

| **Learning Progression Bundle A: Unit A.2, Human Activity and Climate** | **Duration**: |
|---|---|
| *Key Essential Questions:*<br><br>● How do humans depend on earth's resources? | |

- Why do humans interact with the environment and what are the results?

*Transfer Goals:*
*Students will be able to use their learning to*

- Construct an explanation based on evidence to demonstrate a cause and effect relationship {between human activity and the natural environment}
- Analyze data to evaluate the impact [of human activity on earth's systems.
- Evaluate a solution to reduce the impact [of human activity on earth's system.]

**Performance Expectation**

**HS-ESS3-1.**Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

**HS-ESS3-4.**Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*

**HS-ESS3-5.**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

**HS-ESS3-6.**Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

**HS-ETS1-1.**Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

**HS-ETS1-3.**Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

**HS-ETS1-4.**Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Notes:

| **Learning Progression Bundle B: Unit B.1, Energy and Motion** | **Duration**: |
|---|---|

*Key Essential Questions:*

- How can the interactions of objects within a system be explained?
- How can one predict an object's continued motion, changes in motion, or stability?
- What underlying forces explain the variety of interactions observed?

*Transfer Goals:*
*Students will be able to use their learning to*

- Analyze data to determine the existence of a cause and effect relationship {between force and motion}
- Use mathematical representations to explain a system.
- Design a model [to explain the law of conservation of energy.]

**Performance Expectation**

**HS-PS2-1.** Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

**HS-PS2-2.** Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

**HS-PS2-3.** Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.*

**HS-PS3-2** Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as either motions of particles or energy stored in fields.

**HS-PS3-3.**Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*

**HS-PS3-5.**Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. **(see note)**

**HS-ETS1-2.**Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Notes: **HS-PS3-5** is shared with Unit 1 (Electricity, magnetism and Communication). See notes from Unit 1 for more information.

| **Learning Progression Bundle B: Unit B.2, Fundamental Forces + Kepler's Law (Gravity and the Solar System)** | **Duration**: |
|---|---|

*Key Essential Questions:*

- How does gravity control interactions between objects?

*Transfer Goals:*
*Students will be able to use their learning to*

| |
|---|
| ● Use mathematical representations to predict [the interaction of motion and force.] |
| **Performance Expectation** |
| **HS-PS2-4.** Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. |
| **HS-ESS1-4.**Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. |
| Notes: |

| **Learning Progression Bundle B: Unit B.3, Plate Tectonics** | **Duration**: |
|---|---|
| *Key Essential Questions:*<br><br>● How and why is Earth constantly changing?<br>● How do Earth's major systems interact? | |
| *Transfer Goals:*<br>*Students will be able to use their learning to*<br><br>● Develop a model based on evidence illustrating [the relationship between energy and matter in an earth system.]<br>● Analyze geoscience data and apply scientific reasoning to explain [ changes to an earth system.]<br>● Use evidence to identify patterns to explain and predict [earth processes.] | |
| **Performance Expectation** | |
| **HS-ESS1-5.**Evaluate 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. | |
| **HS-ESS1-6.**Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. | |
| **HS-ESS2-1.**Develop 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. | |
| **HS-ESS2-2.**Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth's systems. | |
| **HS-ESS2-3.**Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. | |
| Notes: | |