NFPS Curriculum Design Update

PK-12 Science

February 24, 2025
New Fairfield Public Schools
BOE Curriculum Subcommittee Presentation

Curriculum

HOW STUDENTS LEARN

- Professional Learning Sessions
- Student Voice / Focus Groups

SYSTEMS & STRUCTURES

- Curriculum Framework / Criteria / Guidebook
- Curriculum Design Cycle (5-Year Map)
- Electronic Curriculum Platform

IMPLEMENTATION

- Stage 1 / Transfer Goals - All Disciplines
- Full Curriculum Model - PreK-12 Science
- Standards Review / Research - Social Studies

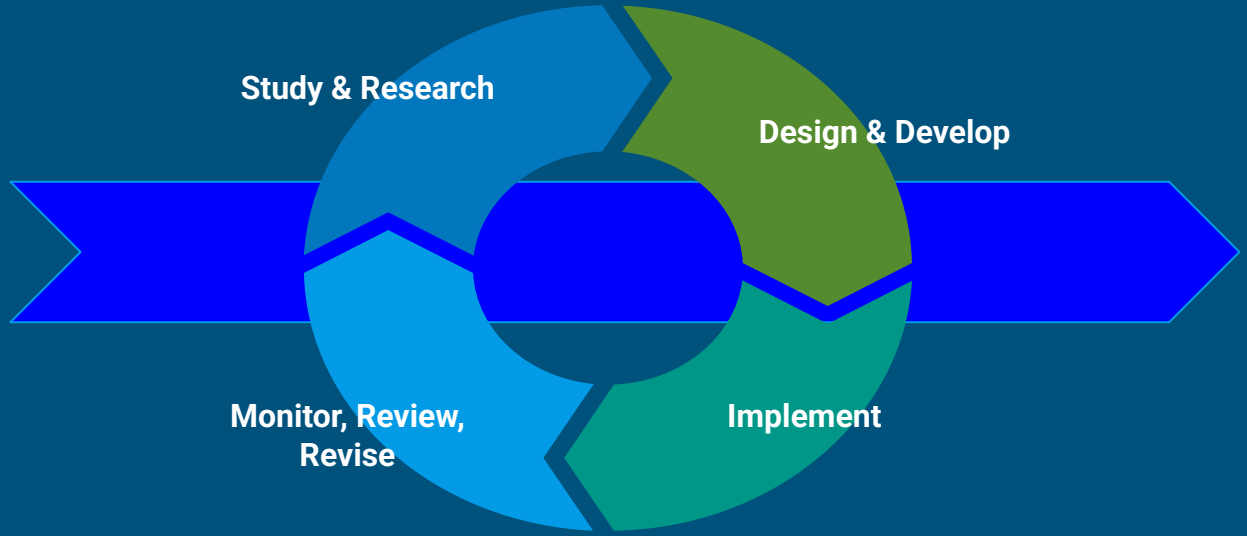
What is Curriculum?

Curriculum is the way in which learning content standards and performance expectations are designed and organized at the district, grade, or course level to define what students should understand, know, and be able to do.

Standards serve as anchors for curriculum; but curriculum is designed to **frame meaning** for those standards, **deepen understanding,** and **ensure relevance and transfer of learning** for students.

Vision

Curriculum Design Process



Systems

Structures

Collaboration and Communication

Guiding Principles

- Curriculum reflects and is grounded in a shared **vision** for teaching and learning.
- **Systems** and **structures** for curriculum foster coherence and consistency.
- A curriculum design process is strengthened through **collaboration** and **communication.**

NFPS Science Transfer Goals

Students will use their learning to:

- Question and seek answers as they make sense of real-world phenomena.
- Model processes and systems from multiple perspectives for understanding and communication to others.
- Collect and analyze data in order to derive meaning and support or refute an argument or claim.
- Engage in innovative thinking and design processes that can lead to solutions for complex problems in our world.

Curriculum Storyboards

Grade 7 Science Units

UNIT 1

Unit 1: Uncovering the Role of Cells in Life

FOCUS OF THE STORY

Is a corn kernel alive? How do you know?

We begin our year exploring these questions to understand the characteristics of life. By planting corn kernels, using microscopes, and conducting experiments, we gather evidence to answer whether corn kernels are alive to understand the hidden processes inside their cells.

UNIT 2

Unit 2: Understanding Genetic Inheritance

FOCUS OF THE STORY

Why do siblings, even twins, look a little different?

We examine cells more closely to learn about DNA and how traits are passed down and shaped by the environment. Through activities like using Punnett squares to predict traits and growing different plants, we uncover how genetics applies to real-world challenges in farming, medicine, and beyond.

UNIT 3

Unit 3: How Adaptations Drive

FOCUS OF THE STORY

How does what you do impact if a species thrives or becomes extinct?

Building on what we learned about genetics, we investigate how traits, the environment, and human actions determine whether animals survive or go extinct. Peppered moths and woolly mammoths help us examine how species change over time and what we can do to protect them.

UNIT 4

Unit 4: Human Choices and Their Impact

FOCUS OF THE STORY

How might our snack choices affect the rainforest and animals that live there?

Continuing our study of adaptation and ecosystems, we connect how the ingredients in everyday snacks, like candy bars, are sourced and how those choices impact plants, animals, and their habitats. We investigate the effects of farming practices on ecosystems to uncover how humans shape life on Earth. This can help us make informed, sustainable decisions for the future.

UNIT 5

Unit 5: Earth's History Through Fossils

FOCUS OF THE STORY

How could fossils from the same animal be found on continents separated by oceans?

Combining what we have learned about ecosystems, extinction, and adaptation, we see how Earth's shifting surface affects the survival of plants, animals, and their habitats. Using fossils, rocks, and maps, we investigate how Earth's changes connect to a species' evolution and extinction and predict how Earth's puzzle pieces continue to shift and reshape the world.

Stage 1 Unit Design Example

Unit 1: Uncovering the Role of Cells in Life

	Course	Grades	Subjects	
	Science - Grade 7	7	Science & Engineering	

Focus of the Story

Is a corn kernel alive? How do you know?

We begin our year exploring these questions to understand the characteristics of life. By planting corn kernels, using microscopes, and conducting experiments, we gather evidence to answer whether corn kernels are alive to understand the hidden processes inside their cells.

About the Learner

In 6th grade, students built foundational knowledge of matter, energy flow, and system interactions, exploring food webs and molecular behaviors. These experiences prepared them to understand living things as systems, connect cellular processes like photosynthesis to energy transfer, and investigate cell structures and functions. In 7th grade, they deepen this understanding, laying the groundwork for genetics and heredity studies.

Possible Misconceptions:

- Cells are not alive because they are too small to see or act independently.
- All cells are identical and perform the same functions.
- Plants and animals do not share similar cellular structures or processes.
- Energy production in cells (like photosynthesis) occurs in all cell types, not just specific organelles like chloroplasts.

About the Learner

- Prior knowledge
- Possible student misconceptions

About the Learner

By the end of the 5th-grade unit, students understand that patterns like day and night, seasonal changes, and star visibility are caused by Earth's rotation and orbit. They know that gravity is a force pulling objects toward Earth's center and can explain how it influences objects in space. Students can model Earth's systems and their interactions, describe how natural processes shape the land, and analyze patterns in natural events. These skills enable them to investigate and predict phenomena like lunar phases, eclipses, and the motion of celestial bodies in the 6th-grade unit.

Possible Misconceptions:

- Gravity only exists on Earth.
- The phases of the Moon are caused by Earth's shadow.
- Seasons are caused by Earth's changing distance from the Sun.

About the Learner

Students entering Unit 5: *Plate Tectonics* bring a foundation from 6th grade where they investigated the forces shaping Earth's surface, including gravity's role in patterns and motion, and modeled large-scale interactions like the water cycle and erosion that connect Earth's systems. Building on this understanding of Earth's dynamic systems, students are prepared to explore tectonic plate movement, its role in shaping landforms, and its influence on ecosystems, using their skills in data analysis and pattern recognition to connect past geological events to present-day phenomena.

***Possible Misconceptions*:**

- The Earth's surface is static, and continents have always been in their current locations.
- Earthquakes and volcanoes are random events, unrelated to plate movements.
- Plate tectonics is caused by external forces, such as weather or human activity.
- All fossils are found in sedimentary rock and are not affected by geological processes like plate movement.
- Continental drift happens quickly, like sudden shifts in position, rather than over millions of years.

Stage 1 Unit Design Example (continued)

Stage 1: Learning Goals

Established Goals

Standards

Next Generation Science Standards

Performance Expectations: Middle School Life Sciences

- Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. *(MS-LS1-1)*
- Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. *(MS-LS1-2)*
- Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. *(MS-LS1-3)*

Transfer

Long-Term Transfer Goals

What kinds of long-term, independent accomplishments are desired? Students will be able to independently use their learning to...

- Students will use their learning to model phenomena from multiple perspectives for understanding and communication to others. *(T1)*

Meaning

Understandings

What specifically do you want students to understand? What inferences should they make? Students will understand that...

- All living organisms are composed of cells that carry out essential functions such as energy transfer, growth, and response to stimuli, even if these functions are not always immediately observable (e.g., dormant seeds). *(U1)*
- The structure of cells and their organelles is directly related to their functions. These specialized structures work together to sustain life processes, enable growth, and support reproduction. *(U2)*

Essential Questions

What thought-provoking questions will foster inquiry, meaning making, and transfer? Students will keep considering...

- How do we know if something is living or nonliving, and what evidence can we use to prove it? *(Q1)*
- Why do plant and animal cells have different structures, and how do these differences help them do their jobs and support life? *(Q2)*
- How do cells get the energy they need to function? *(Q3)*

Stage 1 Unit Design Example (continued)

Acquisition of Knowledge & Skill	
Knowledge	**Skills**
What facts and basic concepts should students know and be able to recall? Students will know...	What discrete skills and processes should students be able to use? Students will be skilled at...
■ All living things share characteristics, including having one or more cell(s) and the ability to grow, reproduce, respond to stimuli, and use energy. *(K1)* ■ Dormant organisms, like seeds, are alive but may not display all characteristics of life immediately. *(K2)* ■ Cell Theory states that all living things are made of cells, cells are the basic unit of structure and function in organisms, and all cells come from pre-existing cells. *(K3)* ■ Cells have specialized structures (organelles) that perform essential functions, including the nucleus, mitochondria, chloroplasts, cell membrane, cell wall, and vacuole. *(K4)* ■ Plant and animal cells share many organelles, but plant cells have unique structures like chloroplasts, large central vacuoles, and cell walls. *(K5)* ■ Photosynthesis converts light energy into chemical energy, producing glucose and oxygen. Cellular respiration breaks down glucose to release energy in the form of ATP, with carbon dioxide and water as	■ Observing and identifying structures of plant and animal cells using a microscope. *(S1)* ■ Comparing and contrasting plant and animal cells, including organelles and their function. *(S2)* ■ Planning and investigating to observe the effects of environmental factors (light, water, nutrients) on plant growth. *(S3)* ■ Analyzing and interpreting data on plant growth to identify patterns and explain the relationship between environmental factors and cellular activity. *(S4)* ■ Developing models to show how cells form tissues, organs, and systems in both plants and animals. *(S5)* ■ Constructing and interpreting models of cellular processes, such as photosynthesis and cellular respiration. *(S6)* ■ Constructing evidence-based arguments to answer the question, “Is a corn kernel alive?” using observations, models, and data. *(S7)*

Stage 1 Unit Design Example (continued)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Next Generation Science Standards Science and Engineering Practices: Middle School ■ Develop and use a model to describe phenomena. (MS-LS1-2) *(MS.SFIP.SEP.1.1)* ■ Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. (MS-LS1-1) *(MS.SFIP.SEP.2.1)* ■ Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. (MS-LS1-3) *(MS.SFIP.SEP.3.1)* ■ Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-LS1-5) *(MS.GDRO.SEP.2.1)*	**Next Generation Science Standards** Disciplinary Core Ideas: Middle School ■ All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1) *(MS.LS1.A.1)* ■ Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2) *(MS.LS1.A.2)* ■ In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3) *(MS.LS1.A.3)* ■ The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6 *(MS.PS3.D.1)* ■ Cellular respiration in plants and animals involves chemical reactions with oxygen that release stored energy. In these processes,	**Next Generation Science Standards** Cross Cutting Concepts: Middle School ■ Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8) *(MS.SFIP.CC.1.1)* ■ Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1) *(MS.SFIP.CC.2.1)* ■ Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3) *(MS.SFIP.CC.3.1)* ■ Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS1-2) *(MS.SFIP.CC.4.1)*

New Fairfield Public Schools Curriculum Unit Design Criteria - REFLECTION Tool

Curriculum Area / Course Title: Grade Level:

Unit Title: Date:

Unit Overview	Reflection Notes
The *unit overview* concisely tells the "story" of the unit in terms of content and concepts.	**Strengths** **Areas for Growth** **Questions**
"About the student" provides unit-relevant insights regarding how students learn, prior knowledge, and/or misconceptions.	**Strengths** **Areas for Growth** **Questions**
The unit makes connections to competencies of the NFPS *Vision of the Learner.*	**Strengths** **Areas for Growth** **Questions**
Stage 1 - Desired Results	**Reflection Notes**
Standards *Standards* from current national or state curriculum standards are prioritized and aligned to the core concepts and learning (e.g., the essence) of the unit.	**Strengths** **Areas for Growth** **Questions**
Standards balance "content" and "practice" standards (if applicable).	**Strengths** **Areas for Growth** **Questions**

This tool is intended to be used by curriculum design teams for reflection and self-assessment during curriculum unit design.

NFPS, 6-24

Curriculum Storyboards

Grade 7 Science Units

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Curriculum Storyboards

HS Biology Science Units

UNIT 1

Unit 1: How Biomolecules Sustain

FOCUS OF THE STORY

Why does pineapple sometimes make your mouth tingle?

We uncover the secrets of the molecules in our food, reading labels to learn how they provide the biomolecules we need. By exploring enzyme activity and real-life examples like lactose intolerance, we discover how our bodies use food to grow, repair, and thrive—laying the foundation to better understand biomolecules for cell function in our next unit.

UNIT 2

Unit 2: Cells and Systems--Working

FOCUS OF THE STORY

How does what we eat affect our brain's ability to focus and learn?

We explore how cells use the nutrients we consume to power critical processes like energy production and maintaining balance. By examining how cells regulate what enters and exits, respond to changes, and work together, we uncover the connection between nutrition, cellular activity, and brain function to better understand how our food choices fuel both our bodies and our minds.

UNIT 3

Unit 3: Growth and Repair--Understanding

FOCUS OF THE STORY

Why do skin injuries heal, but brain injuries often cannot?

Now that we understand how cells work, we ask deeper questions about how they grow and repair damage. We investigate how cells divide and specialize to form different tissues. We also learn why some cells, like those in the skin, can repair easily while others, like those in the brain, cannot. This helps us understand how the body heals and what happens when cell division goes wrong.

UNIT 4

Unit 4: Genetics--The Blueprint of Life

FOCUS OF THE STORY

How did papayas survive a devastating virus with the help of DNA?

Continuing from how cells grow and divide, we explore how DNA provides the instructions for life. We investigate how traits are passed down from parents, how small changes in DNA can create differences, and how scientists can use genetic information to solve problems in health and agriculture. This helps us see how genes shape who we are and how we can use them to improve the world.

UNIT 5

Unit 5: Evolution--Adapting to a Changing

FOCUS OF THE STORY

How did life on Earth survive and adapt after the asteroid that killed the dinosaurs?

After learning how genes create variation, we explore how living things change over time. We investigate how species survive in changing environments, why some go extinct, and how humans impact the survival of species. By studying fossils, DNA, and patterns in nature, we uncover the story of life on Earth and how it continues to evolve.

UNIT 6

Unit 6: Ecology--Balancing Human

FOCUS OF THE STORY

How does the Amazon rainforest connect to the products we love and the health of our planet?

Bringing together everything we have learned, we investigate how ecosystems work and why they matter to life on Earth. We explore how energy and matter cycle through ecosystems and how human actions can change the balance. By asking questions, collecting data, and designing solutions, we figure out ways to protect ecosystems like the Amazon and help create a more sustainable world.

K-12 Vertical Articulation ... Physical Science Example

Kindergarten

Unit 2 - Exploring Pushes and Pulls

FOCUS OF THE STORY

How are big machines - like barges on the water or excavators on land - so strong?

We use blocks, balls, toy cars, and other objects to learn how pushes and pulls make an object move. We learn how these pushes and pulls make an object move faster, go farther, or change direction. Using all that we learn, we can help a tug-boat guide a big boat back out to sea!

Grade 3

Unit 1 - Forces and Interactions

FOCUS OF THE STORY

How can we turn a skateboard into an ice-board?

By designing bridges, testing models of a flying trapeze, and using magnets, we learn about forces that cause objects to stay still or move, even without touching the object. We learn about balanced and unbalanced forces, study gravity and magnetism, and track patterns in the ways objects move. Then, we use all that we have learned to design a board that can travel across the ice on a frozen lake!

Grade 6

Unit 4: Energy Transformations

FOCUS OF THE STORY

What makes a roller coaster go fast?

We apply what we know about forces to explore how energy is stored and transformed. Through experiments, we learn how gravity, friction, and magnetism affect motion and energy. At the end of the unit, we design and build a Rube Goldberg device—a machine that uses multiple steps to perform a simple task—showing how energy transfers and transforms in creative ways.

Grade 8

Unit 1: Forces, Motion, and Energy in Action

FOCUS OF THE STORY

Why do some collisions cause more damage than others?

We work together to understand how forces, motion, and energy interact by looking at real-world crashes. We explore how crashes happen and predict the damage they might cause through experiments and models. Then, we use what we learn to design and build devices that make crashes safer and reduce damage.

HS Physics

Unit 4: The Physics of Motion

FOCUS OF THE STORY

Why do elite athletes, vehicles, and spacecraft move the way they do?

We build on our understanding of forces, energy, and waves to explore the science of motion through hands-on experiments, real-world examples, and mathematical modeling. Whether studying the sprint of an athlete or the launch of a spacecraft, we uncover the forces and energy that shape motion and connect these principles to the world around us.

Curriculum Storyboards

Grade 2 Science Units

UNIT 1

Unit 1 - Interdependence

FOCUS OF THE STORY

How can flowers bloom in "Death Valley", one of the hottest, driest places on Earth?

As we begin our year as scientists, we experiment with plants to understand what they need to grow best. Then we study plant seeds and use models to see how animals play an important part in making sure plant seeds are able to spread and grow in new places. We see how different seeds do this in different ways. All of this helps us examine the different habitats across the Earth - forests, oceans, deserts, grasslands, and swamps - and how different plants and animals are best suited to where they live.

UNIT 2

Unit 2 - Properties of Matter

FOCUS OF THE STORY

How is a metal - like gold or silver - changed from solid to liquid?

That real-world phenomenon launches us into our study of matter. As scientists, we use our observation skills to describe different characteristics and properties of matter. We investigate which materials are good insulators of heat and which materials are not, and we study how different materials can change or be put together in different ways. Then, we use what we know about the properties of different materials to solve design problems, like designing an oven mitt and building a tower out of paper. We might even be able to keep an ice cube from melting!

UNIT 3

Unit 3 - How the Earth Changes

FOCUS OF THE STORY

How can rivers be different colors?

Now we put together our observation skills and our mapping skills to study how the Earth's land and water has changed over time. We learn about erosion and make models to help us understand why there is sand on a beach and how water makes canyons through mountains. We find these landforms on maps and see the connections to nearby bodies of water. We also conduct experiments to observe erosion and design ways to prevent it from happening to protect the land. While some of Earth's processes are slow, we also learn about processes like earthquakes and volcanic eruptions that can cause much faster changes to the Earth.

For Families

Grade 2 Unit Summaries

 **Unit 1 - The Interdependence of Plants and Animals**	How can flowers bloom in one of the hottest, driest places on Earth? Second graders begin their year as scientists measuring and collecting data with plants to understand what they need to grow best. While studying the structure of plant seeds, they use models to understand seed dispersal and how animals play an important part in making sure plant seeds are able to spread and grow in new places. Students investigate how different seed structures function to allow seeds to do this in different ways. Finally, students examine the different habitats across the Earth - forests, oceans, deserts, grasslands, and swamps - and how different plants and animals are best suited for where they live.
 **Unit 2 - Properties of Matter**	How is a metal - like gold or silver - changed from solid to liquid? That real-world phenomenon launches second graders into their study of matter. Students use observation skills to describe different characteristics and properties of matter. They investigate the effects of heating and cooling on states of matter and which materials are good insulators of heat and which materials are not. They also study how different materials can change or be combined in ways that may be reversible or irreversible. Throughout this unit, students use what they learn about the properties of different materials to solve design problems, like designing an oven mitt and building a tower out of paper. They might even be able to keep an ice cube from melting!
 **Unit 3 - Earth's Systems: How the Earth Changes**	How can rivers be different colors? In this unit, second graders integrate observation skills and mapping skills to study how the Earth's land and water has changed over time. They learn about erosion and use models to understand why there is sand on a beach and how water makes canyons through mountains. Students locate these landforms on maps to note the connections to nearby bodies of water. They conduct experiments to observe erosion and design solutions to prevent it, understanding that people can make choices to protect the land. While Earth's processes such as erosion are slow, students also learn about processes like earthquakes and volcanic eruptions that can cause much faster changes to the Earth.

More For Families

Unit 1 - The Interdependence of Plants and Animals

Focus of the Story

How can flowers bloom in "Death Valley", one of the hottest, driest places on Earth? As we begin our year as scientists, we experiment with plants to understand what they need to grow best. Then we study plant seeds and use models to see how animals play an important part in making sure plant seeds are able to spread and grow in new places. We see how different seeds do this in different ways. All of this helps us examine the different habitats across the Earth - forests, oceans, deserts, grasslands, and swamps - and how different plants and animals are best suited to where they live.

Stage 1: Learning Goals

Established Goals

Standards

Next Generation Science Standards

Performance Expectations: 2

- Plan and conduct an investigation to determine if plants need sunlight and water to grow. *(2-LS2-1)*
- Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. *(2-LS2-2)*
- Make observations of plants and animals to compare the diversity of life in different habitats. *(2-LS4-1)*

Vision of a Learner

- **Knowledgeable Scholars:** Pursue their interests and make meaning while developing a depth of background knowledge in all of the core academic domains as well as in life skills such as financial literacy, that they can use to solve problems and succeed in life. *(VOL1)*

Transfer

Long-Term Transfer Goals

What kinds of long-term, independent accomplishments are desired? Students will be able to independently use their learning to...

- Students will use their learning to question and seek answers as they make sense of real-world phenomena. *(T1)*
- Students will use their learning to model phenomena from multiple perspectives for understanding and communication to others. *(T2)*

Meaning

Understandings

What specifically do you want students to understand? What inferences should they make? Students will understand that...

- Plants need water and light to grow. *(U1)*
- Many plants depend on animals for pollination or to disperse their seeds. *(U2)*
- There are many different kinds of living things in different environments throughout the earth. *(U3)*

Essential Questions

What thought-provoking questions will foster inquiry, meaning making, and transfer? Students will keep considering...

- What do plants need to grow? *(Q1)*
- How do animals help plants reproduce? *(Q2)*
- How are plants and animals in different habitats different? *(Q3)*

Acquisition of Knowledge & Skill

Knowledge

What facts and basic concepts should students know and be able to recall? Students will know...

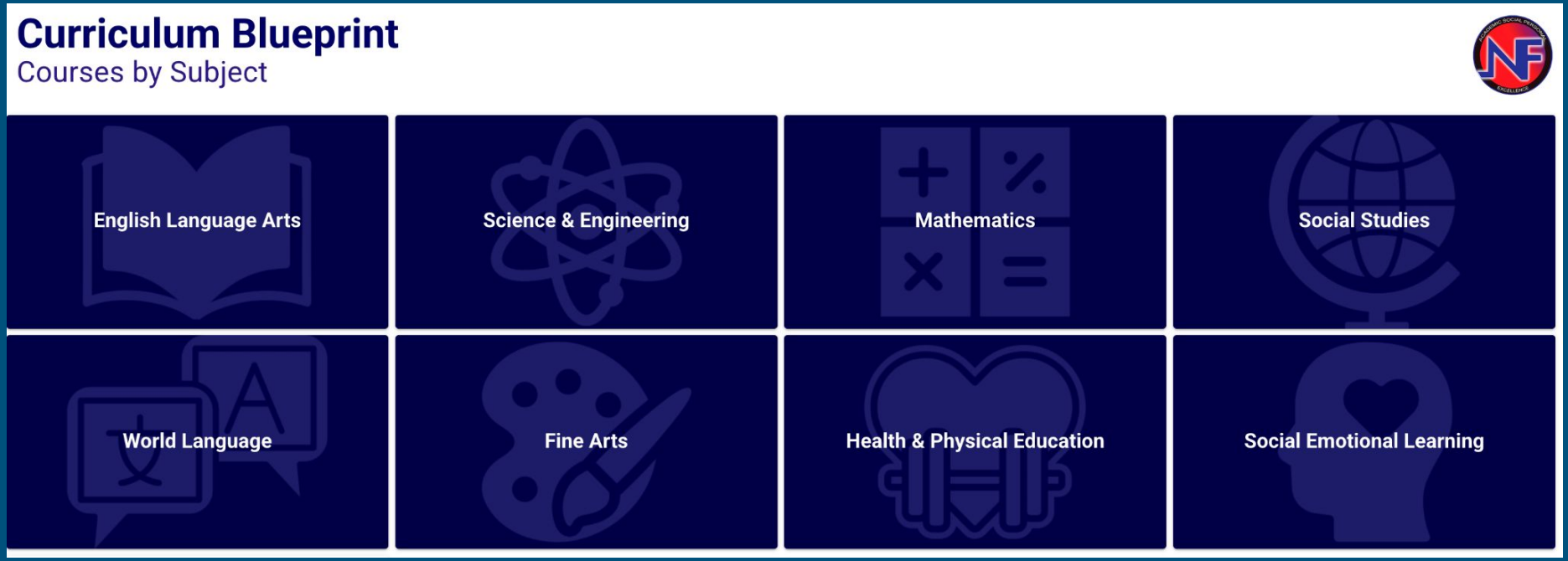
- Water and light, from the sun or another source, are essential for the growth of plants. *(K1)*
- Soil can be helpful, but is not essential, for plant growth. *(K2)*
- Some plants depend on the wind to disperse their seeds or pollen while many depend on animals to disperse their seeds or pollen. *(K3)*
- There are different habitats such as deserts, grasslands, oceans, forests, and swamps. *(K4)*
- There are many different organisms in each of these different habitats that are suited to live there. *(K5)*
- **Vocabulary:** Habitat, Organism, Seed, Pollen, Disperse, Variety *(K6)*

Skills

What discrete skills and processes should students be able to use? Students will be skilled at...

- Raising questions about the needs of plants. *(S1)*
- Planning and carrying out an investigation to test how water and light affect plant growth. (Note opportunities for applying measurement skills and data recording.) *(S2)*
- Developing a model to show how animals help disperse seeds or pollen. *(S3)*

NFPS Curriculum Blueprint (www.newfairfieldschools.org)



Next Steps ...

- **Stage 2: Assessment Design** *(currently underway)*
- **Stage 3: Learning Experiences** *(spring / summer)*
- **K-12 Implementation**, 2025-2026
- **Ongoing Professional Learning**
- **PreK Connections**