



DUBLIN
CITY SCHOOLS

K-12 SCIENCE
Graded Course of Study
2025



Dublin City Schools K-12 Science Graded Course of Study

A K-12 Dublin City Schools science education aims to create lifelong learners who are curious, critical thinkers, and effective collaborators, equipped with the scientific knowledge and skills necessary to navigate and shape a complex and ever-changing world.

Our vision is to inspire students to develop a deep appreciation for science and its applications, empowering them to:

- Ask questions, seek answers, and explore the natural world with a sense of wonder and curiosity.
- Think critically and creatively to solve problems and make informed decisions as a scientifically literate citizen.
- Communicate and collaborate effectively in our diverse community and beyond to address common challenges and create innovative solutions.
- Build their own identity as a scientist in order to apply scientific concepts and methods to understand and address real-world issues competently and confidently.
- Develop the resilience, adaptability, and perseverance needed to succeed in a rapidly evolving world.

Instructional Agreements for Science Learning within the Dublin City Schools

- Teachers will provide opportunities for students to engage in hands-on experiences, projects, and real-world simulations to provide context and relevance to science concepts.
- Teachers will create an environment that emphasizes the importance of effort, perseverance, and reflection in order to learn and grow from both success and failure.
- Content standards will be learned in conjunction with best practices regarding science education.

Together, we will cultivate resourceful, adaptable, and collaborative individuals with the ability to tackle real-world challenges with resilience and innovation.



Dublin City Schools
K-12 Science Graded Course of Study

Nature of Science

One goal of science education is to help students become scientifically literate citizens able to use science as a way of knowing about the natural and material world. All students should have sufficient understanding of scientific knowledge and scientific processes to enable them to distinguish what is science from what is not science and to make informed decisions about career choices, health maintenance, quality of life, community and other decisions that impact both themselves and others.

Scientific Inquiry, Practice and Applications

All students must use these scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas.

Science is a Way of Knowing

Science assumes the universe is a vast single system in which basic laws are consistent. Natural laws operate today as they did in the past and they will continue to do so in the future. Science is both a body of knowledge that represents a current understanding of natural systems and the processes used to refine, elaborate, revise and extend this knowledge.

Science is a Human Endeavor

Science has been, and continues to be, advanced by individuals of various races, genders, ethnicities, languages, abilities, family backgrounds and incomes.

Scientific Knowledge is Open to Revision in Light of New Evidence

Science is not static. Science is constantly changing as we acquire more knowledge.

Scientific and Engineering Practices:

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information



Dublin City Schools
K-12 Science Graded Course of Study

Ohio's Cognitive Demands for Science

Educators will refer to "Ohio's Cognitive Demands for Science" to create experiences for students to engage in science content and demonstrate understanding of scientific concepts in ways that align with current research about how people learn.

**DESIGNING TECHNOLOGICAL/
ENGINEERING SOLUTIONS
USING SCIENCE CONCEPTS**

Requires students to solve science-based engineering or technological problems through application of scientific inquiry. Within given scientific constraints, propose or critique solutions, analyze and interpret technological and engineering problems, use science principles to anticipate effects of technological or engineering design, find solutions using science and engineering or technology, consider consequences and alternatives, and/or integrate and synthesize scientific information.

**DEMONSTRATING SCIENCE
KNOWLEDGE**

Requires students to use scientific practices and develop the ability to think and act in ways associated with inquiry, including asking questions, planning and conducting investigations, using appropriate tools and techniques to gather and organize data, thinking critically and logically about relationships between evidence and explanations, constructing and analyzing alternative explanations, and communicating scientific arguments. (Slightly altered from National Science Education Standards)

**INTERPRETING AND
COMMUNICATING SCIENCE
CONCEPTS**

Requires students to use subject-specific conceptual knowledge to interpret and explain events, phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.

**RECALLING ACCURATE
SCIENCE**

Requires students to provide accurate statements about scientifically valid facts, concepts and relationships. Recall only requires students to provide a rote response, declarative knowledge or perform routine mathematical tasks. This cognitive demand refers to students' knowledge of science fact, information, concepts, tools, procedures (being able to describe how) and basic principles.



Dublin City Schools
K-12 Science Graded Course of Study

Kindergarten

Course Goals

Students in kindergarten will focus on developing the skills for systematic discovery to understand the science of the physical world around them in greater depth by using scientific inquiry. Students will learn about daily and seasonal changes, properties of everyday objects and materials and physical and behavioral traits of living things.

Strand Connections

Living and nonliving things have specific physical properties that can be used to sort and classify. The physical properties of air and water are presented as they apply to weather.

EARTH AND SPACE SCIENCE (ESS)	
Topic: Daily & Seasonal Changes in the Weather and Sky This topic focuses on observing, exploring, describing and comparing weather changes, patterns in the sky and changing seasons.	
Content Statement	Content Elaboration
K.ESS.1: Weather changes are long-term and short term.	Weather changes occur throughout the day and from day to day. • Air is a nonliving substance that surrounds Earth and wind is air that is moving. • Wind, temperature and precipitation can be used to document short-term weather changes that are observable. ◦ Wind, temperature and precipitation are components of the weather that can be observed and measured for kindergarten. ◦ The measurements collected and tools used can be nonstandard and must be age appropriate. For example, the temperature may be above or below a given point (warmer or colder) or the amount of snow may be marked on a dowel rod to check the depth. ◦ Weather measurements should be collected on a regular basis throughout the school year and then compared, explained and discussed each week and each month. • Yearly weather changes (seasons) are observable patterns in the daily weather



Dublin City Schools K-12 Science Graded Course of Study

	changes. ○ At the end of the school year, a comparison can be made and seasons can be identified by the patterns that were measured throughout the year. ● Consistent review and questioning to deepen understanding are essential. ● Use technology to study weather events, record classroom data, compare classroom data to local data, communicate and share data with other classrooms.
K.ESS.2: The moon, sun and stars can be observed at different times of the day or night.	The moon, sun and stars appear in different positions at different times of the day or night. ● Sometimes the moon is visible during the night, sometimes the moon is visible during the day and at other times the moon is not visible at all. ● The observable shape of the moon changes in size very slowly throughout the month. ● The sun is visible only during the day. ● The sun's position in the sky appears to change in a single day and from season to season. ○ Changes in the position of the sun in the sky can be measured and recorded at different times during the school day. Observations can also be made virtually. ○ This data can be compared from month to month to monitor changes. ● Stars are visible at night, some are visible in the evening or morning and some are brighter than others. ○ Stars, groups of stars and different phases of the moon can be observed through books or virtually and documented throughout the month. ○ At times, the moon can be observed in the daylight. Drawings, photographs or other graphics can be used to document student observations. ● Demonstrating (either 3-D or virtual) and testing/experimenting (through kits or models) can be used to explain the changing positions (in the sky) of the sun, stars and moon.

LIFE SCIENCE (LS)

Topic: Physical and Behavioral Traits of Living Things
This topic focuses on observing, exploring, describing and comparing living things in Ohio.

Content Statement	Content Elaboration
K.LS.1: Living things have specific	Build a grade-appropriate understanding of what it means to be living, do not need to



Dublin City Schools
K-12 Science Graded Course of Study

characteristics and traits.	distinguish living and nonliving. Grade-appropriate characteristics of living things • Living things grow, reproduce, require energy and respond to stimuli. ◦ Animals need food for energy; plants acquire energy from the sun. • Living things respond to stimuli (e.g., fish in an aquarium respond to the addition of food). • Living things grow (e.g., seedlings placed in soil grow). Living things are found worldwide. • There are different kinds of living things. • The focus is on familiar organisms (e.g., grass, trees, flowers, cats, dogs, horses). Experiments can be conducted or observations done virtually. • EX: Conduct experiments and explorations to observe what happens when plants are placed in different classroom habitats (e.g., on the floor, in a closet, on a desk). • When studying living things, ethical treatment of animals, safety procedures and proper hygiene must be employed. Respect for and proper treatment of living things must be modeled.
K.LS.2: Living things have physical traits and behaviors, which influence their survival.	Living things are made up of a variety of structures. • Some traits can be observable structures. • Some of these structures and behaviors influence their survival. The focus is not on naming the structures of living things but associating through interaction and observation that living things are made of structures, and because of those structures, living things can do specific activities. • Identify and discuss examples, such as: birds having wings for flying and beaks for eating; dogs having eyes for seeing, teeth for chewing and legs for moving; trees having leaves to capture sunlight and trunks for support. • Concrete experiences are necessary to deepen knowledge of the traits and behaviors of living things. Technology can be used to compare data on the number of honeybees observed in the schoolyard with other schools. • Additional inquiry investigations include conducting observations of pond water (focusing on macroscopic organisms), raising a classroom pet (check for student allergies), bird watching, noting differences between different types of plants and planting seeds and watching them grow.



Dublin City Schools
K-12 Science Graded Course of Study

PHYSICAL SCIENCE (PS)	
Topic: Properties of Everyday Objects and Materials This topic focuses on the production of sound and on observing, exploring, describing and comparing the properties of objects and materials with which the student is familiar.	
Content Statement	Content Elaboration
K.PS.1: Objects and materials can be sorted and described by their properties.	Objects can be sorted and described by the properties of the materials from which they are made. Some of the properties can include color, size and texture. • Objects are made of specific materials (e.g., clay, cloth, paper, metal, glass). • Objects have certain properties (e.g., color, shape, size, temperature, odor, texture, flexibility) that can be described, compared and sorted. • Observations are limited to descriptors such as hot, warm, cold, heavy and light. ◦ Comparisons of objects are a precursor to measurement. Comparisons are used to sort and describe objects (e.g., is the wooden block heavier or lighter than the plastic block?). ◦ Standard and nonstandard measuring tools can give additional information about the environment and can be used to make comparisons of objects and events. ◦ Magnifiers can be used to see detail that cannot be seen with the unaided eye. ◦ Familiar objects from home, the classroom or the natural environment can be explored and investigated. ◦ Students should not use the sense of taste as a way of observing an unknown substance.
K.PS.2: Some objects and materials can be made to vibrate to produce sound.	Sound can be made in many ways. • Sound is produced by touching, blowing or tapping objects. ◦ Objects like cymbals, the tabletop or drums can be tapped to produce sound. ◦ Objects like a rubber band or a guitar string can be plucked to produce sound. ◦ Objects like a bottle or a trumpet can be blown into to produce sound. • The sounds that are produced vary depending on the properties of objects. ◦ A wide variety of sounds can be made with the same object (e.g., a plastic bottle could be tapped or blown into).



Dublin City Schools
K-12 Science Graded Course of Study

- | | |
|--|---|
| | <ul style="list-style-type: none">• Sound is produced when objects vibrate.<ul style="list-style-type: none">◦ Vibrations can be made visible as water splashes when a cymbal or triangle is placed in water or when rice vibrates on the top of a banging drum.• The concepts of pitch (low vs. high notes) and volume (loudness) are introduced.• Sound needs to be experienced, investigated and explored through observations and experimentation.<ul style="list-style-type: none">◦ Standard, virtual and student-constructed instruments can be used to explore sound.◦ Wave descriptions of sound and the propagation of sound energy are not appropriate at this grade level. |
|--|---|