INDIANA DEPARTMENT *of* EDUCATION

# 2024 INDIANA CONTENT CONNECTORS

## SCIENCE

## GRADE 7

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# Indiana Content Connectors Context and Purpose

## Introduction

The Indiana Content Connectors for Grade 7 Science are the result of a process designed to identify, evaluate, synthesize, and create high-quality learning expectations for Indiana students with significant cognitive disabilities.

The Indiana Department of Education (IDOE) convened stakeholder committees to review proposed revisions to Indiana's Alternative Standards, known as content connectors. The content connectors are designed to measure the knowledge and skills of students with the most significant cognitive disabilities and are assessed with the state's alternate assessment. The content connectors are designed to ensure that all Indiana students in this population are prepared with essential knowledge and skills needed to access employment, enrollment, or enlistment leading to service.

## What are the Content Connectors and how should they be used?

The Indiana Content Connectors are designed to help educators, parents, students, and community members understand the necessary content for each grade level, and within each content area domain, to access employment, enrollment, or enlistment leading to service. These content connectors should form the basis for strong core instruction for all students at each grade level and content area. The content connectors identify the minimum academic content or skills to which Indiana students need access in order to be prepared for success after graduation, but they are not an exhaustive list.

While the Indiana Content Connectors establish key expectations for knowledge and skills and should be used as the basis for curriculum, the content connectors by themselves do not constitute a curriculum. It is the responsibility of the local school corporation to select and formally adopt curricular tools, including textbooks and any other supplementary materials, that align with Indiana Content Connectors. Additionally, corporation and school leaders should consider the appropriate instructional sequence of the content connectors as well as the length of time needed to teach each one. Every content connector has a unique place in the continuum of learning, but each content connector will not require the same amount of time and attention. A deep understanding of the vertical articulation of the standards will enable educators to make the best instructional decisions. These content connectors must also be complemented by robust, evidence-based instructional practices to support overall student development. By utilizing strategic and intentional instructional practices, other areas such as STEM and employability skills can be integrated with the content connectors.

## Acknowledgments

IDOE appreciates the time, dedication, and expertise offered by Indiana's K-12 general and special educators, higher education professors, representatives from business and industry, families, and other stakeholders who contributed to the development of the Indiana Content Connectors. We wish to specially acknowledge the committee members, as well as participants in the public comment period, who dedicated many hours to the review and evaluation of these content connectors designed to prepare Indiana students for success after graduation.

## Grade 7 Science

*Standards and content connectors identified as essential for mastery by the end of the grade level are indicated with gray shading and an "E."*

| Indiana Academic Standards | Content Connectors |
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| **Motion and Stability: Forces and Interactions** | |
| **MS-PS2-1: Motion and Stability: Forces and Interactions** Students who demonstrate understanding can: Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects. [Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] (E) | **MS-PS2-1a:** Compare two solutions to a problem involving the motion of two colliding objects, applying Newton's Third Law. [Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] (E) |
| **MS-PS2-2: Motion and Stability: Forces and Interactions** Students who demonstrate understanding can: Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. [Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.] (E) | **MS-PS2-2a:** Use evidence to support the claim that the changes in an object's motion depends on the sum of the forces on the object and the mass of the object. (E) |
| **MS-PS2-3: Motion and Stability: Forces and Interactions** Students who demonstrate understanding can: Ask questions and design a plan to determine the factors that affect the strength of electric and magnetic forces. [Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.] | **MS-PS2-3a:** Use data to determine the factors that affect the strength of electric or magnetic forces. |

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| **MS-PS2-4: Motion and Stability: Forces and Interactions**<br>Students who demonstrate understanding can:<br>Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. [Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the sun, and orbital periods of objects within the solar system.] | **MS-PS2-4a:** Use evidence to support the claim that gravitational forces attract and depend on the masses of the objects. [Clarification Statement: Examples of evidence include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the sun, and orbital periods of objects within the solar system.] (E) |
| **MS-PS2-5: Motion and Stability: Forces and Interactions**<br>Students who demonstrate understanding can:<br>Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. [Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.] | **MS-PS2-5a:** Evaluate evidence needed to support a claim related to the existence of fields (i.e., magnetic fields, gravitational fields, or electric fields) between objects exerting forces on each other even when the objects are not in contact. [Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls.] |
| **Energy** | |
| **MS-PS3-1: Energy**<br>Students who demonstrate understanding can:<br>Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. [Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.] (E) | **MS-PS3-1a:** Use graphical displays of data to describe the relationship of kinetic energy to the mass of an object and the speed of an object. (E) |

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| **MS-PS3-2: Energy**<br>Students who demonstrate understanding can:<br>Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. [Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.] | **MS-PS3-2a:** Use a model to describe how distance affects the amount of potential energy stored in a system. |
| **MS-PS3-3: Energy**<br>Students who demonstrate understanding can:<br>Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. [Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.] (E) | **MS-PS3-3a:** Collect data to test or modify a device to minimize or maximize thermal energy transfer. [Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.] (E) |
| **MS-PS3-4: Energy**<br>Students who demonstrate understanding can:<br>Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. [Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.] | **MS-PS3-4a:** Identify the variables and data needed to conduct an experiment related to the relationships among energy transfer, type of matter, mass, and change in average kinetic energy as measured by the temperature of the sample. |
| | **MS-PS3-4b:** Sequence steps of an investigation related to the relationships among energy transfer, type of matter, mass, and change in average kinetic energy as measured by the temperature of the sample. |

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| **MS-PS3-5: Energy**<br>Students who demonstrate understanding can:<br>Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. [Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] | **MS-PS3-5a:** Use evidence to support the claim that when the kinetic energy of an object changes, energy is transferring to or from the object. |
| **From Molecules to Organisms: Structures and Processes** | |
| **MS-LS1-1: From Molecules to Organisms: Structures and Processes**<br>Students who demonstrate understanding can:<br>Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. [Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.] (E) | **MS-LS1-1a:** Identify the materials/tools to be used to provide evidence that living things are made of one cell or many different numbers and types of cells. [Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.] (E) |
| **MS-LS1-2: From Molecules to Organisms: Structures and Processes**<br>Students who demonstrate understanding can:<br>Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. [Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] (E) | **MS-LS1-2a:** Use a model to describe how cell structures (e.g., nucleus, chloroplasts, mitochondria, cell membrane, cell wall) contribute to the function of the cell as a whole. (E) |

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| **MS-LS1-3: From Molecules to Organisms: Structures and Processes**<br>Students who demonstrate understanding can:<br>Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] | **MS-LS1-3a:** Use evidence to describe the systems and subsystems created when cells form tissues and tissues form organs. |
| **MS-LS1-7: From Molecules to Organisms: Structures and Processes**<br>Students who demonstrate understanding can:<br>Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] | **MS-LS1-7a:** Use a model to describe how food is rearranged and energy is released through chemical reactions in the process of cellular respiration. |
| **MS-LS1-8: From Molecules to Organisms: Structures and Processes**<br>Students who demonstrate understanding can:<br>Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. | **MS-LS1-8a:** Summarize information about how sensory receptors respond to different inputs, sending signals to the brain for immediate behavior or storage as memories. |

| Earth's Place in the Universe | |
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| **MS-ESS1-4: Earth's Place in the Universe**<br>Students who demonstrate understanding can:<br>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. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] | **MS-ESS1-4a:** Sequence the relative order of events from Earth's history shown by rock strata and patterns of layering. [Clarification Statement: Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] |
| **Earth's Systems** | |
| **MS-ESS2-1: Earth's Systems**<br>Students who demonstrate understanding can:<br>Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.] (E) | **MS-ESS2-1a:** Use a model to describe cycling of Earth's materials and flow of energy, including processes of melting, crystallization, weather, deformation, and sedimentation. **(E)** |

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| **MS-ESS2-2: Earth's Systems**<br>Students who demonstrate understanding can:<br>Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.] | **MS-ESS2-2a:** Describe how geoscience processes change Earth's surface at time and spatial scales that can be large (e.g., plate motions) or small (e.g., landslides). |
| | **MS-ESS2-2b:** Explain the different time scales of how water-related processes (e.g., rain, runoff, flood) change the surface of Earth. |
| **MS-ESS2-3: Earth's Systems**<br>Students who demonstrate understanding can:<br>Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. [Clarification Statement: Examples of data include 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).] | **MS-ESS2-3a:** Use evidence of the distribution of fossils to describe past plate motions. |
| | **MS-ESS2-3b:** Identify how the shapes along the edges of continents (fit like a jigsaw puzzle) demonstrate lithospheric plate movement, using models. |
| | **MS-ESS2-3c:** Identify how fossil comparisons along the edges of continents demonstrate lithospheric plate movement. |
| **Earth and Human Activity** | |
| **MS-ESS3-1: Earth and Human Activity**<br>Students who demonstrate understanding can:<br>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. [Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are | **MS-ESS3-1a:** Identify explanations of the uneven distributions of Earth's minerals, energy, and groundwater resources due to past and current geoscience processes. [Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but |

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| significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).] (E) | are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).] (E) |
| **MS-ESS3-2: Earth and Human Activity**<br>Students who demonstrate understanding can:<br>Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).] | **MS-ESS3-2a:** Use data to predict future catastrophic events.<br><br>**MS-ESS3-2b:** Use data to describe a solution to reduce the impact of a natural disaster on humans. [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards.] |
| **Engineering Design** | |
| **MS-ETS1-1: Engineering Design**<br>Students who demonstrate understanding can:<br>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 | **MS-ETS1-1a:** Define criteria and constraints (e.g., scientific principles, potential impacts on people, the natural environment) of a problem to ensure a successful solution. |

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| environment that may limit possible solutions. | |
| **MS-ETS1-2: Engineering Design**<br>Students who demonstrate understanding can:<br>Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. | **MS-ETS1-2a:** Select the best solution to a problem using evidence of alignment to criteria and constraints. |
| **MS-ETS1-3: Engineering Design**<br>Students who demonstrate understanding can:<br>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-ETS1-3a:** Combine the best characteristics from multiple solutions into a new solution to better meet the criteria for success. |
| **MS-ETS1-4: Engineering Design**<br>Students who demonstrate understanding can:<br>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. | **MS-ETS1-4a:** Use a model to generate data on how a design proposal can be modified for improvements through iterative testing. |