MCAS Alternate Assessment (MCAS-Alt)

SCIENCE AND TECHNOLOGY/ENGINEERING PLANNING GUIDE

To support high-quality science experiences for all students, MCAS Alt encourages educators to use and adapt a high-quality science unit in order to develop their MCAS Alt portfolio. This represents a shift in practice where educators might pull activities together from a variety of sources. This planning guide will support you as an educator in this recommended process.

1. **Select a core idea (topic) that is of interest to the student, grade level appropriate, and may relate to other classroom learning:**
    - Remember that you will need to choose core ideas from three of the four disciplines for grades 5 and 8.
    - High School will choose 3 of the 4 core ideas in ONE discipline.

2. **Select a high-quality science unit aligned with your core idea.**
    - A list of units linked to specific core idea topics is provided below.

3. **Plan how the student will interact with the anchoring phenomenon of the unit.**

    All high-quality science units are anchored on a scientific *phenomenon* (observable event) or *design problem* that is related to the core idea and of interest to the student.
    - A scientific phenomenon is an observable event that can be investigated and explained by students using STE knowledge and skills.
    - Design problems should be real-world examples of practical problems that can be solved, such as wanting to build a stable structure.

    The anchoring phenomenon will be the way you introduce the unit to the student to get them engaged in the topic and to motivate the rest of the unit. This may provide evidence for an access skill/entry point but is generally informal. This could look like:
    - Free or loosely structured exploration of materials
    - Videos and images
    - Demonstrations
    - Readings
    - Guided investigations
    - Notice and wonder protocol

    The student may do this verbally, through writing, or with drawings. You can use sentence stems (I see… I wonder… This is like...), allow them to write on/interact directly with an image, and provide other supports to get the student interacting with and relating to the phenomena.

4. **Use the anchoring activities to support you in completing the skills survey.**

5. **As your students experience the unit, select three pieces of evidence that correspond with three access skills/entry points.**

TOPICS FOR CORE IDEAS IN
EARTH AND SPACE SCIENCE

➢ Earth's Place in the Universe

- Sun, Moon, stars, solar system, Milky Way
- Earth's orbit and rotation
- Seasons and ocean tides
- Moon's orbit and phases, eclipses
- Shadows (outdoors)
- Gravity, orbital motion of planets, moons and asteroids
- Simple landforms, formation through erosion and deposition
- Rock layers, fossil records, index fossils and relative age of layers/ rock formation

Related units:

- SOLID Start "Sky Patterns" (Grade 1)
- Sprocket "Shadows" and "Stars" (Grade 5)
- OpenSciEd "Earth in Space" (Grades 6-8)

➢ Earth's System

- Water cycle
- Fresh Water Resources
- Weather and climate
- Landforms and physical features on maps
- Weathering and Erosion
- Earthquakes and volcanoes
- Weather interactions
- Plate tectonics and formation of geological features
- Natural and human made

Related units:

- SOLID Start "Weather Forecasting" (KG) "Disappearing Dunes" (Grade 2)
- Sprocket "Dynamic Earth" (Grade 4)
- OpenSciEd "Plate Tectonics & Rock Cycling" and "Weather, Climate & Water Cycling" (Grades 6-8)

➢ Earth and Human Activity

- Natural resources
- Renewable and non-renewable resources (energy)
- Examples of ways humans reduce their impact on the Earth's resources and environment
- Preparations for severe weather
- Climate Change/Global warming
- Reducing severe weather impacts

Related units:

- SOLID Start "Ever-Changing Environments" (KG) and "Engineering Toys" (Grade 2)
- NGSS Storylines "Where does our clean water come from and where does it go after we make it dirty?" (Grade 5)
- OpenSciEd "Earth's Resources & Human Impact" (Grades 6-8)

TOPICS FOR CORE IDEAS IN
LIFE SCIENCE (3-8) AND BIOLOGY (HS)

➢ From Molecules to Organisms

- Plants and animals' structure and parts
- The senses FOR ALL ANIMALS
- Life cycles of plants and animals (including reproduction)
- Plants and animals' necessities for living
- Cells and cell structures (including unicellular vs multicellular)
- Photosynthesis
- Plant and animal cells
- Food molecules
- Carbohydrate, protein, fat and nucleic acid (organic molecules)
- Body systems
- Transcription & Translation
- Homeostasis
- Cell cycle
- Cellular Respiration

Related units:

- SOLID Start "Puzzling Plants" (Grade 2),
- NGSS Storylines "Why is Our Corn Changing?" (Grade 2)
- "How Do Eggs Become Chickens or Other Living Things (Grades 6-8)
- OpenSciEd "Cells & Systems", "Metabolic Reactions" and "Matter Cycling & Photosynthesis" (Grades 6-8)
- Inquiry Hub "How Can Science Help Make Our Lives Better?" (High School)

➢ Ecosystems: Interactions, Energy, and Dynamics

- Producers, consumers, and decomposers
- Types of interactions: competitive vs symbiotic relationships
- Biotic and abiotic factors; carrying capacity
- Plants and animal needs from environment
- Living and non-living parts of the ecosystem
- Natural or human-made shifts to ecosystems
- Role of photosynthesis, cellular respiration, and decomposition
- Food webs/food chains: cycling and conservation of matter/energy in an ecosystem
- Composter design
- Disruptions (natural and manmade) in the ecosystem
- Changes to the biodiversity of an ecosystem and availability of resources
- Trophic Levels and 10% rule of energy transfer (amount available energy at each trophic level)
- Carbon cycling
- Human effects on biodiversity and health of ecosystem

Related units:

- SOLID Start "Quest for Survival" (Grade 1)
- "You Live Where, Polar Bear? (Grade 2)
- NGSS Storylines "Why are There Different Plants Growing in Different Places?" (Grade 2)
- Sprocket "Why do I see Squirrels but No Stegosauruses?" (Grade 3)
- MySci "From Sun to Food" (Grade 5)
- OpenSciEd "Ecosystem Dynamics" and "Matter Cycling & Photosynthesis" (Grades 6-8)
- Inquiry Hub "How Do Small Changes Make Big Impacts on Ecosystems?" (High School)
- Carolina "Matter Cycling and Energy Transfer in Lake Ecosystems" (High School)

➢ Heredity: Inheritance and Variations of Traits

- Plants and animals: parent and offspring similarities/differences
- Inherited traits: DNA transfer from parent to offspring
- Genetic variation via sexual reproduction, meiosis, mutation:
- Impact of Nature (genetic factors) vs Nurture (environmental factors)
- Sexual vs asexual reproduction
- Genes, chromosomes, and mutations
- Punnett Squares, genotype and phenotype probabilities

Related units:

- SOLID Start "Quest for Survival" (Grade 1)
- NGSS Storylines "Why are There Different Plants Growing in Different Places?" (Grade 2)
- Sprocket "How can we help the birds near our school grow up and thrive?" (Grade 3)
- OpenSciEd "Genetics" (Grades 6-8)
- Inquiry Hub "How Can Science Help Make Our Lives Better?" (High School)

➢ Biological Evolution: Unity and Diversity

- Adaptation, fitness and Natural selection
    - Reproduction, Adaptation and Extinction
- Speciation
- Natural selection vs Artificial selection
- Fossils and evidence of evolution
- Evolutionary relationships (common ancestry)

Related units:

- SOLID Start "Quest for Survival" (Grade 1)
- Sprocket "Why do I see So Many Squirrels But I Can't Find Any Stegosauruses?" (Grade 3)
- OpenSciEd "Natural Selection & Common Ancestry" (Grades 6-8)
- Inquiry Hub "How Do Populations Change Over Time?" (High School)

TOPICS FOR CORE IDEAS IN PHYSICAL SCIENCE (3-8) AND INTRODUCTORY PHYSICS (HS)

➢ Matter and Its Interactions

- Solids, liquids, and gas (physical characteristics), particle models of substances and changes in particle motion
- Man-made versus naturally occurring (properties of each)
- Phase changes and conservation of mass
- Observable properties of various materials
- Atomic models of substances: molecules, compounds, mixtures
- Chemical reactions (combining two or more substances)
- Chemical vs physical changes
- Exothermic/endothermic chemical reactions (thermal energy)
    - Including during fission, fusion and radioactive decay
- Compare densities of different materials (using given formula)
- Molecules and particle motion at different phases/temperatures
- Pure substances
- Density

Related units:

- SOLID Start "Engineering Toys" (Grade 2)
- SAIL "Garbage" (Grade 5)
- NGSS Storylines Where Does Our Clean Water Come From and Where Does It Go After We Make It Dirty? (Grade 5)
- Sprocket "Chemistry of Taste" (Grade 5)
- OpenSciEd "Thermal Energy", "Chemical Reactions & Matter" (Grades 6-8)
- Why Do Some Things Get Colder (or Hotter) When They React? (High School)
- CREATE for STEM "Interactions Units 1&2" (High School)

➢ Motion and Stability: Forces and Interactions

- Newton's Laws
- Types of Forces
- Kinetic energy (motion)
- Gravitational, electric, and magnetic fields
- Various effects on gravitational, electric, and magnetic forces
- Directionality based on motion and force
- Conservation of momentum
- Electric current and magnetic fields
- Series and parallel circuits
- Free body diagrams and force, speed and velocity calculations

Related units:

- SOLID Start "Boxcar Challenge" (Grade K)
- Sprocket "Toys/Forces & Motion" (Grade 3)
- OpenSciEd "Contact Forces" and "Forces at a Distance" (Grades 6-8)
- CREATE for STEM "Interactions Units 1&2" (High School)

➢ Energy

- Transfer of energy: sound, light, heat, and electric current
- Relationships among kinetic energy, mass, and speed of an object
- Changes in energy when objects collide
- Particle models of substances, when energy is added and removed
- Relationship between the relative positions of objects interacting at a distance and their relative potential energy
- Potential (gravitational, elastic, and chemical) and kinetic energy (motion, sound, thermal, and light)
- Thermal energy transfer: convection, conduction, and radiation
- Calculate change in energy and total energy within a system (including energy entering and leaving)
- Design and evaluate device to convert one form of energy to another form of energy

Related units:

- SOLID Start "Playground Engineering" (Grade K)
- Sprocket "Energy in Our World" (Grade 4)

Related units (cont.):

- OpenSciEd “Thermal Energy”, “Chemical Reactions & Energy”, “Contact Forces” (Grades 6-8)
- CREATE for STEM “Interactions Units 1&2” (High School)

➢ Waves and their Application in Technologies for Information Transfer

- Sound, volume, vibrations, and pitch
- Shadows and light sources
- Waves
- Reflection of light rays and mechanical waves
- Transfer of information transfer information through encoding, sending, receiving, and decoding a pattern

Related units:

- SOLID Start “Reading Under Cover” and “Feel the Music” (Grade 1)
- NGSS Storylines “How Does Light Help Me See Things and Communicate with Others? (Grade 1)
- “Why Do Some Things Wash up on the Beach and Other’s Don’t?” (Grade 4)
- Sprocket “Waves” (Grade 4)
- OpenSciEd “Light & Matter” and “Sound Waves” (Grades 6-8)

TOPICS FOR CORE IDEAS IN
TECHNOLOGY/ENGINEERING

➢ Engineering Design

- Problem/situation that needs improvement or development
- Develop multiple solutions (drawings, models, scaled drawings, technology)
- Plan and carry out design, construct prototype of a solution
- Test, analyze and evaluate design solutions
- Potential impact of solution on people and environment
- interpret and apply scale and proportion to visual representations
- Communicate design solutions, features, and limitations

Related units:

- SOLID Start "Playground Engineering" "Boxcar Challenge, "Engineering Toys"

  (Grades K-2)
- OpenSciEd "Natural Hazards" (Grades 6-8)

➢ Materials, Tools, and Manufacturing

- Compare use of various types of tools based on need
- Compare properties of various metals, plastics, woods, and ceramics for flexibility, hardness, conductivity, and melting point
- Safe and appropriate use of measuring tools, hand tools, fasteners, and common hand-held power tools to construct prototype
- Basic processes in manufacturing

Related units:

- SOLID Start "Playground Engineering" "Boxcar Challenge, "Engineering Toys"

  (Grades K-2)
- OpenSciEd "Contact Forces", "Chemical Reactions & Matter", "Thermal Energy"

  (Grades 6-8)

➢ Technological Systems

- Provide innovations and inventions
- Use sketches/drawings to show parts of a product or device
- Function and benefits of various communication systems:
    - radio, television, print, internet
- Encoder, transmitter, receiver, decoder, and storage
- Components of transportation
- Structural function, how physical features relate to design use
- Manufacturing
- Material composition and physical processing, effects of changes in physical processing on material properties

Related units:

- OpenSciEd “Natural Hazards” (Grade 6-8)