Welcome to Michigan’s K-7 Grade Level Content Expectations

Purpose & Overview
In 2004, the Michigan Department of Education embraced the challenge of creating Grade Level Content Expectations in response to the federal No Child Left Behind Act of 2001. This act mandated the existence of a set of comprehensive state grade level assessments in Mathematics and English Language Arts that are designed based on rigorous grade level content. In addition, assessments for science in elementary, middle and high school, were required. To provide greater clarity for what students are expected to know and be able to do by the end of each grade, expectations for each grade level have been developed for science.

In this global economy, it is essential that Michigan students possess personal, social, occupational, civic, and quantitative literacy. Mastery of the knowledge and essential skills defined in Michigan’s Grade Level Content Expectations will increase students’ ability to be successful academically, and contribute to the future businesses that employ them and the communities in which they choose to live.

Reflecting best practices and current research, the Grade Level Content Expectations provide a set of clear and rigorous expectations for all students, and provide teachers with clearly defined statements of what students should know and be able to do as they progress through school.

Development
In developing these expectations, the Scholar Work Group depended heavily on the Science Framework for the 2009 National Assessment of Educational Progress (National Assessment Governing Board, 2006) which had been the gold standard for the high school content expectations. Additionally, the National Science Education Standards (National Research Council, 1996), the Michigan Curriculum Framework in Science (2000 version), and the Atlas for Science Literacy, Volumes One (AAAS, 2001) and Two (AAAS, 2007), were all continually consulted for developmental guidance. As a further resource for research on learning progressions and curricular designs, Taking Science to School: Learning and Teaching Science in Grades K-8 (National Research Council, 2007) was extensively utilized. The following statement from this resource was a guiding principle:

"The next generation of science standards and curricula at the national and state levels should be centered on a few core ideas and should expand on them each year, at increasing levels of complexity, across grades K-8. Today’s standards are still too broad, resulting in superficial coverage of science that fails to link concepts or develop them over successive grades."

Michigan’s K-7 Scholar Work Group executed the intent of this statement in the development of “the core ideas of science…the big picture” in this document.
Curriculum
Using this document as a focal point in the school improvement process, schools and districts can generate conversations among stakeholders concerning current policies and practices to consider ways to improve and enhance student achievement. Together, stakeholders can use these expectations to guide curricular and instructional decisions, identify professional development needs, and assess student achievement.

Assessment
The Science Grade Level Content Expectations document is intended to be a curricular guide with the expectations written to convey expected performances by students. Science will continue to be assessed in grades five and eight for the Michigan Educational Assessment Program (MEAP) and MI-Access.

Understanding the Organizational Structure
The science expectations in this document are organized into disciplines, standards, content statements, and specific content expectations. The content statements in each science standard are broader, more conceptual groupings. The skills and content addressed in these expectations will, in practice, be woven together into a coherent, science curriculum.

To allow for ease in referencing expectations for the draft review, each expectation has been coded with a discipline, standard, grade-level, and expectation number. For example, **P.MO.00.09** indicates:

- **P** - Physical Science Discipline
- **MO** - Motion of Objects Standard
- **00** - Kindergarten Expectation
- **09** - Ninth Expectation in the Kindergarten Grade-Level

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(Note: Final coding will be different than this draft document coding, and will incorporate content statements and content expectations into the coding.)

Preparing Students for Academic Success
Within the hands of teachers, the Grade Level Content Expectations are converted into exciting and engaging learning for Michigan’s students. As we use these expectations to develop units of instruction and plan instructional delivery, it is critical to keep in mind that content knowledge alone is not sufficient for academic success. Students must be able to apply knowledge in new situations, to solve problems by generating new ideas, and to make connections between what they learn in class to the world around them. The art of teaching is what makes the content of learning become a reality.

Through the collaborative efforts of Michigan educators and creation of professional learning communities, we can enable our young people to attain the highest standards, and thereby open doors for them to have fulfilling and successful lives.
SCIENCE PROCESSES Inquiry, Reflection, and Social Implications

S.IR.05.1 Inquiry involves generating questions, conducting investigations, and developing solutions to problems through reasoning and observation. Inquiry includes an analysis and presentation of findings that lead to future questions, research, and investigations.

S.IR.05.01 Generate scientific questions based on observations, investigations, and research.
S.IR.05.02 Design and conduct scientific investigations.
S.IR.05.03 Use tools and equipment appropriate to scientific investigations.
S.IR.05.04 Use metric measurement devices in an investigation.
S.IR.05.05 Construct charts and graphs from data and observations.
S.IR.05.06 Identify patterns in data.
S.IR.05.07 Analyze information from data tables and graphs to answer scientific questions.

S.IR.05.2 Reflecting knowledge is the application of scientific knowledge to new and different situations. Reflecting knowledge requires careful analysis of evidence that guides decision-making and the application of science throughout history.

S.IR.05.08 Evaluate the strengths and weaknesses of claims, arguments, and data.
S.IR.05.09 Describe limitations in personal and scientific knowledge.
S.IR.05.10 Identify the need for evidence in making scientific decisions.
S.IR.05.11 Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities.
S.IR.05.12 Design solutions to problems using technology.
S.IR.05.13 Describe the effect humans and other organisms have on the balance in the natural world.
S.IR.05.14 Describe how science and technology have advanced because of the contributions of many people throughout history and across cultures.

PHYSICAL SCIENCE Motion of Objects

P.MO.05.2 Motion can be described by a change in position relative to a point of reference. An object’s motion can be described by its speed and the direction it is moving. An object’s position and speed can be measured and graphed as a function of time.

P.MO.05.15 Explain the motion of an object relative to its point of reference.
P.MO.05.16 Describe the motion of an object in terms of distance, time and direction, as the object moves, in relationship to other objects.
P.MO.05.17 Illustrate how motion can be measured and represented on a graph.
**P.MO.05.3** Forces have a magnitude and direction. Forces can be added. The net force on an object is the sum of all of the forces acting on the object. An object’s speed and/or direction of motion changes when a non-zero net force is applied to it. A balanced force on an object does not change the object’s motion (the object either remains at rest or continues to move at a constant speed in a straight line).

**P.MO.05.18** Describe how constant motion is the result of balanced forces.

**P.MO.05.19** Describe how changes in the motion of objects are caused by unbalanced forces.

**P.MO.05.20** Relate the size of change in motion to the strength of unbalanced forces and the mass of the object.

**P.MO.07.4** Some forces between objects act when the objects are in direct contact (touching), such as friction and air resistance, or when they are not in direct contact (not touching), such as magnetic force, electrical force, and gravitational force.

**P.MO.05.21** Explain how contact forces change an object’s motion.

**P.MO.05.22** Explain how non-contact forces change an object’s motion.

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**LIFE SCIENCE**

**Organization of Living Things**

**L.OL.05.4** Multicellular organisms may have specialized systems that perform functions that serve the needs of the organism.

**L.OL.05.23** Identify the general purpose of selected animal systems (digestive, circulatory, respiratory, skeletal, muscular, nervous, excretory, and reproductive).

**L.OL.05.24** Explain how animal systems (digestive, circulatory, respiratory, skeletal, muscular, nervous, excretory, and reproductive) work together to perform selected activities.
Evolution

L.EV.05.1 *Species with certain traits are more likely than others to survive and have offspring in particular environments. When an environment changes, the advantage or disadvantage of the species’ characteristics can change. Extinction of a species occurs when the environment changes and the characteristics of a species are insufficient to allow survival.*

L.EV.05.25 Describe the attributes of organisms that help them survive.

L.EV.05.26 Describe how fossils provide evidence about the nature of ancient (extinct) and modern life forms.

L.EV.05.27 Explain how behavioral characteristics (adaptation, instinct, learning, habit) of animals help them to survive in their environment.

L.EV.05.2 *Similarities among organisms are found in anatomical features, which can be used to infer the degree of relatedness among organisms. In classifying organisms, biologists consider details of internal and external structures to be more important than behavior or general appearance.*

L.EV.05.28 Relate degree of similarity in anatomical features to the classification of contemporary organisms.

L.EV.05.29 Describe how scientific theory traces evolutionary relationships among present and past life forms.

EARTH SCIENCE

Solid Earth

E.SE.05.2 *Rocks and rock formations bear evidence of the minerals, materials, temperature/pressure conditions, and forces that created them.*

E.SE.05.30 Explain the rock cycle as it relates to the three rock types (igneous, sedimentary and metamorphic).

E.SE.05.31 Compare and contrast the formation of the different rock types, and demonstrate the similarities and differences using a model.

E.SE.05.32 Classify rock samples as igneous (granite, basalt, obsidian, pumice), metamorphic (marble, slate, quartzite), and sedimentary (sandstone, limestone, shale, conglomerate).

E.SE.05.33 Identify common rock forming minerals (quartz, feldspar, mica, halite, hematite, hornblende).
E.SE.05.3 Soils consist of weathered rocks and decomposed organic materials from dead plants, animals, and bacteria. Soils are often found in layers with each having a different chemical composition and texture.

E.SE.05.34 Explain how physical and chemical weathering leads to erosion and the formation of soils and sediments.

E.SE.05.35 Describe how soil is a mixture, made up of weather eroded rocks, humus, formed through decomposition of once living things.

E.SE.05.36 Compare different soil samples based on particle size and texture.

E.SE.05.5 Earth’s lithospheric plates constantly move, resulting in major geological events, such as earthquakes, volcanic eruptions, and mountain building.

E.SE.05.37 Explain plate tectonic movement and how the lithospheric plates move centimeters each year.

E.SE.05.38 Demonstrate how major geological events (earthquakes, volcanic eruptions, mountain building) result from these plate motions.

E.SE.05.39 Describe evidence that supports the theory of Pangaea.

E.SE.05.40 Describe the three types of plate boundaries (convergent, divergent, transform) and geographic features associated with them (continental rifts and mid-ocean ridges, volcanic and island arcs, deep sea trenches).

E.SE.05.41 Describe Earth’s layers as a lithosphere (crust and upper mantle), convecting mantle, and dense metallic core.

E.SE.05.6 Earth as a whole has a magnetic field that is detectable at the surface with a compass.

E.SE.05.42 Describe the Earth as a magnet and compare Earth’s magnetic properties to that of a natural or man-made magnet.

E.SE.05.43 Explain how a compass works using Earth’s magnetic field.

E.SE.05.44 Explain how people have used compasses to aid in navigation on land and sea.
Earth in Space and Time

_E.ST.05.3_ Fossils provide important evidence of how life and environmental conditions have changed in a given location.

_E.ST.05.45_ Explain how rocks and fossils are used to identify extinct plants and animals.

_E.ST.05.46_ Explain how rocks and fossils are used to understand the age and geological history of the earth (timelines and relative dating, rock layers).

_E.ST.05.4_ Earth processes seen today (erosion, mountain building, and glacier movement) make possible the measurement of geologic time through methods such as observing rock sequences and using fossils to correlate the sequences at various locations.

_E.ST.05.47_ Explain how waves, wind, water, glacier movement, and ice, shape and reshape the Earth’s land surface by eroding rock and sand in some areas, and depositing them in other areas.

_E.ST.05.48_ Describe how the history of the Earth is influenced by occasional natural occurrences, such as the impact of an asteroid or comet.

_E.ST.05.49_ Describe how fossils provide important evidence of how life and environmental conditions have changed.