

HPS Scope & Sequence
K-8 Grade Level Essential Skills
DRAFT
August 2009

Grade Level: 8
Subject: Science






Howell Public Schools (HPS), like many of our fellow Michigan districts, has studied the work of Dr. Robert Marzano and other educational consultants. In his book *What Works in Schools: Translating Research into Action*, Marzano points to the necessity of school districts having a “guaranteed and viable curriculum.” Marzano stresses the importance of everyone in the school community understanding what skills will be taught for mastery at each grade level, and then guaranteeing that happens. Using this research, our district is undertaking the task of creating an aligned curriculum that prepares students to successfully meet the academic rigors of Michigan’s Grade Level Content Expectations (GLCEs).

During the 2008-09 school year, small groups of teachers worked under the guidance of curriculum consultants and HPS administrators to study the core content curriculums of English, math, science and social studies. Through professional development efforts, these groups learned to identify subsets of fundamental, non-negotiable content expectations that require a higher degree of mastery than the other expectations within the content area. HPS has chosen to call these fundamental, non-negotiable content expectations for each grade level subject “Essential Skills”. Teacher groups then assigned a recommended number of lessons, per quarter, needed to successfully teach each GLCE, thus securing the curriculum as viable. Vocabulary, a researched component to uniform student achievement, was identified by quarter (nine-week sessions). Examples of formative assessments were provided for each expectation, with the creation of uniform summative assessments to follow the final approval of this document. Upon completion of draft essential skills for each subject, the teacher groups used supporting MDE documents to align their chosen skills horizontally for grades kindergarten through eight.

The essential skills found within this document will be piloted in the 2009-2010 school year. Our teaching staff will provide on-going feedback on the document during this pilot. At the conclusion of each semester the original teacher groups will re-assemble under the guidance of educational consultants and HPS administration to review the edit suggestions. These steps will culminate in revisions for a final document.






It should be noted that as a subset of Michigan’s Grade Level Content Expectations, the overall number of expectations identified as essential skills is smaller than the total articulated within the State’s course expectation documents. This is the intentional result of a process that asked teacher leaders to identify fundamental content expectations that require a higher degree of mastery than others included within the discipline. Expectations that were not considered fundamental to the success of all students are not included in this document, but may be found on the MDE web site at http://www.michigan.gov/mde/0,1607,7-140-28753_33232---,00.html

Quarter 1

Standard or GLCE #	Standard or GLCE Language	What this means:	Q	Lessons or Days	Examples of Formative Assessments	Vocabulary
	Students will			42		
						
Standard E1: Inquiry, Reflection, and Social Implications						
E1.1A	Generate new questions that can be investigated in the laboratory or field.	Ask questions that can be tested.	1	2		Closed System Hydrosphere Geosphere Biosphere
E1.1B	Evaluate the uncertainties or validity of scientific conclusions using an understanding of sources of measurement error, the challenges of controlling variables, accuracy of data analysis, logic of argument, logic of experimental design, and/or the dependence on underlying assumptions.	Analyze all parts of a lab activity	1	2		Radioactive Decay Gravity Solar Energy Biomass Renewable
E1.1C	Conduct scientific investigations using appropriate tools and techniques (e.g., selecting an instrument that measures the desired quantity—length, volume, weight, time interval, temperature—with the appropriate level of precision).	Use appropriate tools to conduct a lab activity	1	2		Nonrenewable resource Fossil fuels Nuclear energy Conduction Convection Radiation
E1.1D	Identify patterns in data and relate them to theoretical models.	analyze data and look for trends	1	2		Limestone Carbonic acid
E1.1E	Describe a reason for a given conclusion using evidence from an investigation.	Use evidence to support conclusions	1	2		Carbon cycle Renewable
E1.2A	Critique whether or not specific questions can be answered through scientific investigations.	Evaluate questions and determine if they can be tested	1	2		NonRenewable energy Deforestation
E1.2B	Identify and critique arguments about personal or societal issues based on scientific evidence.	Understand how science relates to society	1	2		Reef destruction Ozone depletion Stratosphere
E1.2C	Develop an understanding of a scientific concept by accessing information from multiple sources. Evaluate the scientific accuracy and significance of the information.	Understand importance of using multiple resources	1	2		
E1.2D	Evaluate scientific explanations in a peer review process or discussion format.	Evaluate one another's conclusions with class discussions	1	2		
E1.2E	Evaluate the future career and occupational prospects of science fields.	Understand future science career opportunities	1	2		
Standard E2: Earth Systems						






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Standard or GLCE #	Standard or GLCE Language	What this means:	Q	Lessons or Days	Examples of Formative Assessments	Vocabulary
	Students will			42		
						
E2.1A	Explain why the Earth is essentially a closed system in terms of matter.	Explain what a closed system is	1	2		
E2.1B	Analyze the interactions between the major systems (geosphere, atmosphere, hydrosphere, biosphere) that make up the Earth.	Understand the different spheres of Earth	1	2		
E2.1C	Explain, using specific examples, how a change in one system affects other Earth systems.	Explain how Earth's systems interact	1	2		
E2.2A	Describe the Earth's principal sources of internal and external energy (e.g., radioactive decay, gravity, solar energy).	Describe the Earth's energy sources	1	2		
E2.2B	Identify differences in the origin and use of renewable (e.g., solar, wind, water, biomass) and nonrenewable (e.g., fossil fuels, nuclear [U-235]) sources of energy.	Understand the origin/use of renewable/non renewable resources	1	3		
E2.3A	Explain how carbon exists in different forms such as limestone (rock), carbon dioxide (gas), carbonic acid (water), and animals (life) within Earth systems and how those forms can be beneficial or harmful to humans.	Explain Carbon in it's different forms and how those forms can hurt or help humans.	1	2		
E2.4A	Describe renewable and nonrenewable sources of energy for human consumption (electricity, fuels), compare their effects on the environment, and include overall costs and benefits.	Describe energy sources humans use	1	3		
E2.4B	Explain how the impact of human activities on the environment (e.g., deforestation, air pollution, coral reef destruction) can be understood through the analysis of interactions between the four Earth systems.	Explain the effect humans have on environment	1	3		
E2.4c	Explain ozone depletion in the stratosphere and methods to slow human activities to reduce ozone depletion.	Explain how can humans slow ozone loss	1	3		

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Quarter 2

Standard or GLCE #	Standard or GLCE Language	What this means:	Q	Lessons or Days	Examples of Formative Assessments	Vocabulary
	Students will			40		
						
Standard E2: Earth Systems						metamorphic rock sedimentary rock igneous rock felsic mafic pluton
E2.4d	Describe the life cycle of a product, including the resources, production, packaging, transportation, disposal, and pollution.	Explain the life cycle of a product	2	2		batolith cementation stratification crust mantle core lithosphere asthenosphere
Standard E3: The Solid Earth						magnetic field sea floor spreading mid-ocean ridge plate tectonics subduction zone continental drift divergent boundary convergent boundary subduction boundary collision boundary transform boundary rift
E3.1A	Discriminate between igneous, metamorphic, and sedimentary rocks and describe the processes that change one kind of rock into another.	Students will know the different types of rocks and how they change from one to another	2	6		rift valley deep sea trench convection, slab pull, ridge push convection slab pull ridge push Pangaea
E3.2A	Describe the interior of the Earth (in terms of crust, mantle, and inner and outer cores) and where the magnetic field of the Earth is generated.	Describe the inside of the Earth	2	4		
E3.3A	Explain how plate tectonics accounts for the features and processes (sea floor spreading, mid-ocean ridges, subduction zones, earthquakes and volcanoes, mountain ranges) that occur on or near the Earth's surface.	Explain how the movement of the Earth's surface creates the Earth's features	2	4		
E3.3B	Explain why tectonic plates move using the concept of heat flowing through mantle convection, coupled with the cooling and sinking of aging ocean plates that result from their increased density.	Explain why the Earth's surface moves	2	4		
E3.3C	Describe the motion history of geologic features (e.g., plates, Hawaii) using equations relating rate, time, and distance.	Describe how the Earth moves and has changed over time	2	3		
E3.3d	Distinguish plate boundaries by the pattern of depth and magnitude of earthquakes.	Describe what factors effect the strength of earthquakes	2	3		
E3.r3e	Predict the temperature distribution in the lithosphere as a function of distance from the mid-ocean ridge and how it relates to ocean depth. <i>(recommended)</i>	Describe how ground temperature changes as you get further away from a mid ocean ridge	2	3		






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	Students will			40		
						
E3.r3f	Describe how the direction and rate of movement for the North American plate has affected the local climate over the last 600 million years. <i>(recommended)</i>	How has plate movement affected local climate over the past 600 Million years	2	3		craton terrane magnitude Richter Scale
E3.4A	Use the distribution of earthquakes and volcanoes to locate and determine the types of plate boundaries.	Students will locate and know types of plate boundaries based on earthquakes and boundaries	2	2		Seismograph epicenter focus
Standard E5: The Earth in Space and Time						
E5.3A	Explain how the solar system formed from a nebula of dust and gas in a spiral arm of the Milky Way Galaxy about 4.6 Ga (billion years ago).	Planets, stars and solar systems form	2	6		p waves s waves body waves surface waves North American plate






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Quarter 3						
Standard or GLCE #	Standard or GLCE Language	What this means:	Q	Lessons or Days	Examples of Formative Assessments	Vocabulary
	Students will			40		
						
Standard E2: Earth Systems						freshwater reservoir sustainability residence times gradient watershed basin inputs outputs wetlands water table porosity permeability capillary action aquifer saturation aeration water budget thermohaline circulation boundary currents climactic zones air masses Frontal boundaries Air masses troposphere trough Mitigation squall line supercell vortex storm surge mesocyclone
E2.2C	Describe natural processes in which heat transfer in the Earth occurs by conduction, convection, and radiation.	Describe how heat transfers through the Earth	3	2		
Standard E4: The Fluid Earth						
E4.1A	Compare and contrast surface water systems (lakes, rivers, streams, wetlands) and groundwater in regard to their relative sizes as Earth's freshwater reservoirs and the dynamics of water movement (inputs and outputs, residence times, sustainability).	Compare and contrast the amounts and movement of freshwater on the surface and on the ground	3	11		
E4.1C	Explain how water quality in both groundwater and surface systems is impacted by land use decisions.	Explain how water quality is affected by land use	3	6		
E4.2B	Explain how interactions between the oceans and the atmosphere influence global and regional climate. Include the major concepts of heat transfer by ocean currents, thermohaline circulation, boundary currents, evaporation, precipitation, climatic zones, and the ocean as a major CO2 reservoir.	Explain how the oceans and atmosphere interact and affect climate	3	3		
E4.3A	Describe the various conditions of formation associated with severe weather (thunderstorms, tornadoes, hurricanes, floods, waves, and drought).	Describe the conditions associated with severe weather	3	3		
E4.3B	Describe the damage resulting from and the social impact of thunderstorms, tornadoes, hurricanes, and floods.	Describe how severe weather affects people	3	3		






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	Students will			40		
						
E4.3C	Describe severe weather and flood safety and mitigation.	Describe how people deal with severe weather	3	3		
E4.3D	Describe the seasonal variations in severe weather.	Describe how severe weather changes with the seasons	3	3		
E4.3E	Describe conditions associated with frontal boundaries that result in severe weather (thunderstorms, tornadoes, and hurricanes).	Students will know what causes storms	3	3		
E4.3F	Describe how mountains, frontal wedging (including dry lines), convection, and convergence form clouds and precipitation.	Describe how clouds and precipitation are formed	3	3		

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Quarter 4						
Standard or GLCE #	Standard or GLCE Language	What this means:	Q	Lessons or Days	Examples of Formative Assessments	Vocabulary
	Students will			43		
						
Standard E2 : Earth Systems						big bang orbit em radiation em spectrum doppler effect
E2.2D	Identify the main sources of energy to the climate system.	Identify the sources of energy that drive our climate	4	4		continuous spectrum absorbtion spectrum emission spectrum
Standard E5: The Earth in Space and Time						sunspot photosphere chromosphere corona Solar wind Solar flare aurora solar prominences filament Aurora satellite power grid nuclear fusion greenhouse effect methane nitrous oxide meteorite impacts global warming ice age
E5.1A	Describe the position and motion of our solar system in our galaxy and the overall scale, structure, and age of the universe.	Describe how the solar system is structured and how it moves	4	4		
E5.2A	Identify patterns in solar activities (sunspot cycle, solar flares, solar wind).	Identify patterns in sunspot activity	4	4		
E5.2B	Relate events on the Sun to phenomena such as auroras, disruption of radio and satellite communications, and power grid disturbances.	How do the sun's activities interfere with modern technology and nature	4	4		
E5.2C	Describe how nuclear fusion produces energy in the Sun.	Describe how the sun produces energy	4	4		
E5.3A	Explain how the solar system formed from a nebula of dust and gas in a spiral arm of the Milky Way Galaxy about 4.6 Ga (billion years ago).	Planets, stars and solar systems form	2	6		
E5.4A	Explain the natural mechanism of the greenhouse effect including comparisons of the major greenhouse gases (water vapor, carbon dioxide, methane, nitrous oxide, and ozone).	Explain the greenhouse effect	4	4		
E5.4B	Describe natural mechanisms that could result in significant changes in climate (e.g., major volcanic eruptions, changes in sunlight received by the earth, meteorite impacts).	Describe how changes in nature can effect climate	4	4		
E5.4C	Analyze the empirical relationship between the emissions of carbon dioxide, atmospheric carbon dioxide levels and the average global temperature over the past 150 years.	Explain the effect of carbon dioxide on global warming	4	5		

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	Students will			43		
						
E5.4D	Based on evidence of observable changes in recent history and climate change models, explain the consequences of warmer oceans (including the results of increased evaporation, shoreline and estuarine impacts, oceanic algae growth, and coral bleaching) and changing climatic zones (including the adaptive capacity of the biosphere).	Explain how global warming effects our oceans and climate	4	4		