



Science Field Review

October 2 – December 1, 2006

Functional Independence, Supported Independence, and Participation (FI/SI/P)

Extended Benchmarks (EB)

Background Information: The federal No Child Left Behind Act of 2001 mandated the existence of a set of comprehensive state assessments that are designed and based on rigorous content. The MI-Access Science Assessment Plan Writing Team (APWT) extended the Michigan Curriculum Framework's Science Content Benchmarks, 2000 version (MCF v.2000) for the Functional Independence, Supported Independence, and Participation (FI/SI/P) student populations during the 2005-2006 school year. The draft Extended Benchmarks (EB) require field review in order to ensure they are appropriate for each population.

Instructions: Please complete the online survey for the MI-Access FI/SI/P EB in order to provide the Michigan Department of Education your feedback. The survey is located at www.mi.gov/mi-access in the "Survey Information" category.

SCIENCE

REFLECTING ON SCIENTIFIC KNOWLEDGE

Extended Benchmarks

MI-Access Functional Independence, Supported Independence, and Participation

The science benchmarks in this document are taken from the Michigan Curriculum Framework Science Content Benchmarks, 2000 version (MCF v.2000). These benchmarks have been extended for the MI-Access Functional Independence, Supported Independence, and Participation populations, and are presented in this document. The coding key below explains abbreviations found in this document, including the benchmark and extended benchmark codes.

Table of Contents and Coding Key

Content Area: Science (S)

Level of Independence:

Full Independence: These students would most likely participate in the Michigan Educational Assessment Program (MEAP) assessments with or without accommodations.

MI-Access Population:

Functional Independence (FI)

Supported Independence (SI)

Participation (PA)

Strand: Reflecting on Scientific Knowledge (R) [In MCF v.2000: II]

Standard:

Reflecting on Scientific Knowledge (RO) [In MCF v.2000: II.1]2

Grade Level:

Elementary (e)

Middle School (m)

High School (h)

Extended Benchmark

EB01, EB02, etc. [In MCF v.2000: 1, 2, etc.]

n/a = Not applicable

SCIENCE

STRAND: REFLECTING ON SCIENTIFIC KNOWLEDGE (RO)

All students will analyze claims for their scientific merit and explain how scientists decide what constitutes scientific knowledge:

Level (MEAP, FI, SI, PA) and Assessable at: (Classroom/LEA/ISD, State)	Grade Level		
	Elementary School	Middle School	High School
Science Benchmark v.2000	<p>II.1.e.1 Develop an awareness of the need for evidence in making decisions scientifically.</p> <p><i>Key concepts:</i> (K-2) observations; (3-5) data, evidence, sample, fact, opinion.</p> <p><i>Real-world contexts:</i> Deciding whether an explanation is supported by evidence in simple experiments, or relies on personal opinion.</p>	<p>II.1.m.1 Evaluate the strengths and weaknesses of claims, arguments, or data.</p> <p><i>Key concepts:</i> Aspects of arguments such as data, evidence, sampling, alternate explanation, conclusion; inference, observation.</p> <p><i>Real-world contexts:</i> Deciding between alternate explanations or plans for solving problems; evaluating advertising claims or cases made by interest groups; evaluating sources of references.</p>	<p>II.1.h.1 Justify plans or explanations on a theoretical or empirical basis.</p> <p><i>Key concepts:</i> Aspects of logical argument, including evidence, fact, opinion, assumptions, claims, conclusions, observations.</p> <p><i>Real-world contexts:</i> Any in the sections on Using Scientific Knowledge.</p>

<p>Draft Functional Independence Extended Benchmark</p> <p>Classroom/LEA/ISD and State</p>	<p>S.FI.R.RO.e.EB01 Distinguish between observations and inferences in science.</p> <p><i>Key concepts:</i> Fact and opinion, observation, evidence, sample.</p> <p><i>Real-world contexts:</i> Printed advertisements, television commercials, radio</p>	<p>S.FI.R.RO.m.EB01 Explain the need for evidence in making decisions scientifically.</p> <p><i>Key concepts:</i> Fact and opinion, observation, evidence, sample, data, conclusions.</p> <p><i>Real-world contexts:</i> Health/body systems, tobacco/alcohol abuse, food decisions, exercise decisions.</p>	<p>S.FI.R.RO.h.EB01 Evaluate a plan based on the strengths and weaknesses of claims, arguments, or data.</p> <p><i>Key concepts:</i> Fact and opinion, observation, evidence, sample, data, draw conclusions.</p> <p><i>Real-world contexts:</i> Health/body systems, tobacco/alcohol abuse, food decisions, exercise decisions.</p>
<p>Draft Supported Independence Extended Benchmark</p> <p>Classroom/LEA/ISD</p>	<p>S.SI.R.RO.e.EB01 Distinguish between true and false.</p> <p><i>Key concepts:</i> Observation, true/false, common science misconceptions.</p> <p><i>Real-world contexts:</i> Observable facts, such as the sky is blue, the sun is hot.</p>	<p>S.SI.R.RO.m.EB01 Distinguish between fact and opinion.</p> <p><i>Key concepts:</i> Fact/opinion, observation, collect data.</p> <p><i>Real-world contexts:</i> Preferences and favorites of soda pop amongst classmates.</p>	<p>S.SI.R.RO.h.EB01 Identify data or observations that support an explanation.</p> <p><i>Key concepts:</i> Fact/opinion, observation, collect data, draw conclusions.</p> <p><i>Real-world contexts:</i> General scams (such as Internet, phone), rules vs. desires, safety—stranger danger.</p>
<p>Draft Participation Extended Benchmark</p>			

	Elementary School	Middle School	High School
Science Benchmark v.2000	None	<p>II.1.m.2 Describe limitations in personal knowledge.</p> <p><i>Key concepts:</i> Recognizing degrees of confidence in ideas or knowledge from different sources, evaluating dates and sources of references.</p> <p><i>Real-world contexts:</i> Any in the sections on Using Scientific Knowledge.</p>	<p>II.1.h.2 Describe some general limitations of scientific knowledge.</p> <p><i>Key concepts:</i> Understanding of the general limits of science and scientific knowledge as constantly developing human enterprises; recognizing that arguments can have emotive, economic, and political dimensions as well as scientific.</p> <p><i>Real-world contexts:</i> Any in the sections on Using Scientific Knowledge.</p>
<p>Draft Functional Independence Extended Benchmark</p> <p>Classroom/LEA/ISD and State</p>	n/a	<p>S.FI.R.RO.m.EB02 Recognize limitations in personal knowledge.</p> <p><i>Key concepts:</i> Fact vs. opinion, when to ask for help, who to ask for help, where to get information.</p> <p><i>Real-world contexts:</i> Career choices/interests, safety issues, social interactions, news.</p>	<p>S.FI.R.RO.h.EB02 Describe limitations in personal knowledge.</p> <p><i>Key concepts:</i> Fact vs. opinion, when to ask for help, who to ask for help, where to get information.</p> <p><i>Real-world contexts:</i> Career choices/interests, safety issues, social interactions, news.</p>

<p>Draft Supported Independence Extended Benchmark</p> <p>Classroom/LEA/ISD and State</p>	<p>n/a</p>	<p>S.SI.R.RO.m.EB02 Recognize limitations in personal knowledge/abilities.</p> <p><i>Key concepts:</i> Fact/opinion, when to ask for help, who to ask for help, where to get information.</p> <p><i>Real-world contexts:</i> Class selection, team sports, games, safety issues, social interactions.</p>	<p>S.SI.R.RO.h.EB02 Recognize limitations in personal knowledge/abilities.</p> <p><i>Key concepts:</i> Fact/opinion, when to ask for help, who to ask for help, where to get information.</p> <p><i>Real-world contexts:</i> Class selection, team sports, games, nutrition choices, career choices, safety issues, social interaction, news.</p>
<p>Draft Participation Extended Benchmark</p> <p>Classroom/LEA/ISD</p>	<p>n/a</p>	<p>S.PA.R.RO.m.EB01 Develop awareness of personal information.</p> <p><i>Key concepts:</i> Name, address, phone number.</p> <p><i>Real-world contexts:</i> Safety, advocacy.</p>	<p>S.PA.R.RO.h.EB01 Develop awareness of personal information.</p> <p><i>Key concepts:</i> Name, address, phone number, names of family members.</p> <p><i>Real-world contexts:</i> Safety, advocacy.</p>

All students will show how science is related to other ways of knowing:			
	Elementary School	Middle School	High School
Science Benchmark v.2000	<p>II.1.e.2 Show how science concepts can be illustrated through creative expression such as language arts and fine arts.</p> <p><i>Key concepts:</i> Poetry, expository work, painting, drawing, music, diagrams, graphs, charts.</p> <p><i>Real-world contexts:</i> Explaining simple experiments using paintings and drawings; describing natural phenomena scientifically and poetically.</p>	<p>II.1.m.3 Show how common themes of science, mathematics, and technology apply in real-world contexts.</p> <p><i>Key concepts:</i> Systems subsystems, feedback models, mathematical constancy, scale, conservation, structure, function, adaptation.</p> <p><i>Real-world contexts:</i> Any in the sections on Using Scientific Knowledge.</p>	<p>II.1.h.3 Show how common themes of science, mathematics, and technology apply in real-world contexts.</p> <p><i>Key concepts:</i> Systems subsystems, feedback models, mathematical constancy, scale, conservation, structure, function, adaptation.</p> <p><i>Real-world contexts:</i> Any in the sections on Using Scientific Knowledge.</p>
<p>Draft Functional Independence Extended Benchmark</p> <p>Classroom/LEA/ISD at all levels and State at middle and high school</p>	<p>S.FI.R.RO.e.EB02 Show how simple science concepts can be illustrated through creative expression.</p> <p><i>Key concepts:</i> Drawing, painting, music, poetry.</p> <p><i>Real-world contexts:</i> Representing natural phenomena artistically, representing labs through art.</p>	<p>S.FI.R.RO.m.EB03 Identify how science relates to the world around them.</p> <p><i>Key concepts:</i> Recycling, hygiene, measurement, seasons, population, transportation, conservation, weather.</p> <p><i>Real-world contexts:</i> Hand washing, using a microwave oven, choosing appropriate clothes for the weather, sorting paper/plastic.</p>	<p>S.FI.R.RO.h.EB03 Demonstrate how science relates to the world around them.</p> <p><i>Key concepts:</i> Technology, recycling, hygiene, measurement, seasons, population, transportation, conservation, weather, historical development of major scientific advancements.</p> <p><i>Real-world contexts:</i> Hand washing, using a microwave oven, choosing appropriate clothes for the weather, sorting paper/plastic, driving an automobile.</p>

<p>Draft Supported Independence Extended Benchmark</p> <p>Classroom/LEA/ISD at all levels and State at middle and high school</p>	<p>S.SI.R.RO.e.EB02 Explore how simple science concepts can be illustrated through creative expression.</p> <p><i>Key concepts:</i> Drawing, painting, music, creative movements.</p> <p><i>Real-world contexts:</i> Representing natural phenomena artistically, representing labs through art.</p>	<p>S.SI.R.RO.m.EB03 Identify the science concepts in common activities.</p> <p><i>Key concepts:</i> Hygiene, cooking, seasons, weather, recycling.</p> <p><i>Real-world contexts:</i> Hand washing, using a microwave oven, choosing appropriate clothes for the weather, sorting paper/plastic.</p>	<p>S.SI.R.RO.h.EB03 Identify the science concepts in common activities.</p> <p><i>Key concepts:</i> Hygiene, cooking, seasons, weather, transportation.</p> <p><i>Real-world contexts:</i> Hand washing, using a microwave oven, choosing appropriate clothes for the weather.</p>
<p>Draft Participation Extended Benchmark</p> <p>Classroom/LEA/ISD</p>	<p>S.PA.R.RO.e.EB01 Explore science activities that relate to the world around them through creative expression.</p> <p><i>Key concepts:</i> Senses (five traditional senses—sight, hearing, smell, taste, touch—plus vestibular sense and proprioceptive sense); seasons.</p> <p><i>Real-world contexts:</i> Cooking, eating, sensory exploration, weather.</p>	<p>S.PA.R.RO.m.EB02 Explore science activities that relate to the world around them.</p> <p><i>Key concepts:</i> Senses (five traditional senses—sight, hearing, smell, taste, touch—plus vestibular sense and proprioceptive sense); seasons.</p> <p><i>Real-world contexts:</i> Cooking, eating, sensory exploration, weather, functional tools.</p>	<p>S.PA.R.RO.h.EB02 Explore science activities that relate to the world around them.</p> <p><i>Key concepts:</i> Senses (five traditional senses—sight, hearing, smell, taste, touch—plus vestibular sense and proprioceptive sense); seasons.</p> <p><i>Real-world contexts:</i> Cooking, eating, sensory exploration, weather, functional tools.</p>

	Elementary School	Middle School	High School
Science Benchmark v.2000	None	None	<p>II.1.h.4 Discuss the historical development of key scientific concepts and principles.</p> <p><i>Key concepts:</i> Historical, political, social, and economic factors influencing the development of science. See <i>Benchmarks for Science Literacy, AAAS, Chapter 10.</i></p> <p><i>Real-world contexts:</i> Historical development of key scientific theories.</p>
Draft Functional Independence Extended Benchmark			
Draft Supported Independence Extended Benchmark			
Draft Participation Extended Benchmark			

All students will show how science and technology affect our society:

	Elementary Benchmarks	Middle School Benchmarks	High School Benchmarks
Science Benchmark v.2000	<p>II.1.e.3 Describe ways in which technology is used in everyday life.</p> <p><i>Key concepts:</i> Provide faster and farther transportation and communication, organize information and solves problems, save time.</p> <p><i>Real-world contexts:</i> Cars, other machines, radios, telephones, computer games, calculators, appliances, e-mail, the World Wide Web.</p>	<p>II.1.m.4 Describe the advantages and risks of new technologies.</p> <p><i>Key concepts:</i> Risk, benefit, side effect, advantage, disadvantage.</p> <p><i>Real-world contexts:</i> Technological systems for manufacturing, transportation, energy distribution, housing, medicine (such as cloning, genetic engineering).</p>	<p>II.1.h.5 Explain the social and economic advantages and risks of new technology.</p> <p><i>Key concepts:</i> Cost-benefit analysis; See LO h.5 (health technology), PME-IV.1 h.1 (household and agricultural materials, EG-V.1 h.4 (resource use), LEC-III.5 h.6 (effects of urban development and agriculture on ecosystems), EAW-V.3 h.4 (air pollution), EH-V.2 h.2 (water pollution.)</p> <p><i>Real-world contexts:</i> Issues related to new technologies, including ones in health-care, transportation, communications, manufacturing, information and media.</p>
<p>Draft Functional Independence Extended Benchmark</p> <p>Classroom/LEA/ISD and State</p>	<p>S.FI.R.RO.e.EB03 Identify ways in which technology is used in everyday life.</p> <p><i>Key concepts:</i> Transportation, communication, household appliances.</p> <p><i>Real-world contexts:</i> Computer, Internet, calculator, television, appliances, automobile, plane.</p>	<p>S.FI.R.RO.m.EB04 Describe ways in which technology is used in everyday life.</p> <p><i>Key concepts:</i> Transportation, communication, household appliances.</p> <p><i>Real-world contexts:</i> Computer, Internet, calculator, television, appliances, automobile, plane.</p>	<p>S.FI.R.RO.h.EB04 Identify the advantages and risks of technology in everyday life.</p> <p><i>Key concepts:</i> Risk, benefit, advantage, disadvantage, side effects.</p> <p><i>Real-world contexts:</i> Computer, Internet, appliances, telephone, driving an automobile, cooking, cleaning solvents.</p>

<p>Draft Supported Independence Extended Benchmark</p> <p>Classroom/LEA/ISD and State</p>	<p>S.SI.R.RO.e.EB03 Identify ways in which technology is used in everyday life.</p> <p><i>Key concepts:</i> How technology changes our lives.</p> <p><i>Real-world contexts:</i> Computer, calculator, television, appliances, telephone, hand-washing dishes/dishwasher, hand-sewing/sewing machine, handwriting/word processing.</p>	<p>S.SI.R.RO.m.EB04 Identify ways in which technology is used in everyday life.</p> <p><i>Key concepts:</i> Transportation, communication, household appliances.</p> <p><i>Real-world contexts:</i> Computer, Internet, calculator, television, appliances, telephone, automobile.</p>	<p>S.SI.R.RO.h.EB04 Identify the advantages and risks of everyday technology.</p> <p><i>Key concepts:</i> Transportation, communication, household appliances; risks, benefits, safety.</p> <p><i>Real-world contexts:</i> Computer, Internet, calculator, television, appliances, telephone, automobile.</p>
<p>Draft Participation Extended Benchmark</p> <p>Classroom/LEA/ISD</p>	<p>S.PA.R.RO.e.EB02 Explore activities in which technology is used in everyday life.</p> <p><i>Key concepts:</i> Computer, television, appliances, assistive technology devices, toys.</p> <p><i>Real-world contexts:</i> Technology can enhance daily living.</p>	<p>S.PA.R.RO.m.EB03 Explore ways in which technology is used in everyday life.</p> <p><i>Key concepts:</i> Computer, television, appliances, assistive technology devices, video games.</p> <p><i>Real-world contexts:</i> Technology can enhance daily living and leisure activities.</p>	<p>S.PA.R.RO.h.EB03 Explore ways in which technology is used in everyday life.</p> <p><i>Key concepts:</i> Computer, television, appliances, assistive technology devices, video games, MP3 players.</p> <p><i>Real-world contexts:</i> Technology can enhance daily living, leisure, and vocational activities.</p>

	Elementary Benchmarks	Middle School Benchmarks	High School Benchmarks
Science Benchmark v.2000	<p>II.1.e.4 Develop an awareness of and sensitivity to the natural world.</p> <p><i>Key concepts:</i> Appreciation of the balance of nature and the effects organisms have on each other, including the effects humans have on the natural world.</p> <p><i>Real-world contexts:</i> Any in the sections on Using Scientific Knowledge appropriate to elementary school.</p>	<p>II.1.m.5 Develop an awareness of and sensitivity to the natural world.</p> <p><i>Key concepts:</i> Appreciation of the balance of nature and the effects organisms have on each other, including the effects humans have on the natural world.</p> <p><i>Real-world contexts:</i> Any in the sections on Using Scientific Knowledge appropriate to middle school.</p>	<p>II.1.h.6 Develop an awareness of and sensitivity to the natural world.</p> <p><i>Key concepts:</i> Appreciation of the balance of nature and the effects organisms have on each other, including the effects humans have on the natural world.</p> <p><i>Real-world contexts:</i> Any in the sections on Using Scientific Knowledge appropriate to high school.</p>
Draft Functional Independence Extended Benchmark Classroom/LEA/ISD	<p>S.FI.R.RO.e.EB04 Develop an awareness of and sensitivity to the natural world.</p> <p><i>Key concepts:</i> Pollution, environment.</p> <p><i>Real-world contexts:</i> Pollution, environment, recycling.</p>	<p>S.FI.R.RO.m.EB05 Develop an awareness of and sensitivity to the natural world.</p> <p><i>Key concepts:</i> Pollution, environment.</p> <p><i>Real-world contexts:</i> Recycling, wetlands, ground water, forest fires.</p>	<p>S.FI.R.RO.h.EB05 Develop an awareness of and sensitivity to the natural world.</p> <p><i>Key concepts:</i> Pollution, environment.</p> <p><i>Real-world contexts:</i> Recycling, wetlands, ground water, epidemics.</p>
Draft Supported Independence Extended Benchmark Classroom/LEA/ISD	<p>S.SI.R.RO.e.EB04 Develop an awareness of the natural world.</p> <p><i>Key concepts:</i> Nature, observation, personal safety.</p> <p><i>Real-world contexts:</i> Caring for environment, pollution, recycling; water safety.</p>	<p>S.SI.R.RO.m.EB05 Develop an awareness of the natural world.</p> <p><i>Key concepts:</i> Nature, observation, environment, personal safety.</p> <p><i>Real-world contexts:</i> Caring for environment, pollution, recycling, habitats; water safety, weather safety.</p>	<p>S.SI.R.RO.h.EB05 Develop an awareness of the natural world.</p> <p><i>Key concepts:</i> Preserving nature, community service, concept of conservation, personal safety.</p> <p><i>Real-world contexts:</i> Caring for environment, pollution, recycling, habitats; water safety, weather safety, yard maintenance.</p>

Draft Participation Extended Benchmark	S.PA.R.RO.e.EB03 Develop an awareness of the natural world.	S.PA.R.RO.m.EB04 Develop an awareness of the natural world.	S.PA.R.RO.h.EB04 Develop an awareness of the natural world.
Classroom/LEA/ISD	<i>Key concepts:</i> Indoors/outdoors, cold/hot, wet/dry. <i>Real-world contexts:</i> Outdoor/pedestrian safety, outdoor games, water safety.	<i>Key concepts:</i> Indoors/outdoors, cold/hot, wet/dry. <i>Real-world contexts:</i> Outdoor/pedestrian safety, outdoor games, water safety, plant care.	<i>Key concepts:</i> Indoors/outdoors, cold/hot, wet/dry. <i>Real-world contexts:</i> Outdoor/pedestrian safety, outdoor games, water safety, plant/lawn care.

All students will show how people of diverse cultures have contributed to and influenced developments in science:

	Elementary School	Middle School	High School
Science Benchmark v.2000	II.1.e.5 Develop an awareness of contributions made to science by people of diverse backgrounds and cultures. <i>Key concepts:</i> Scientific contributions made by people of diverse cultures and backgrounds. <i>Real-world contexts:</i> Any in the sections on Using Scientific Knowledge appropriate to this benchmark.	II.1.m.6 Recognize the contributions made in science by cultures and individuals of diverse backgrounds. <i>Key concepts:</i> Cultural contributions to science, contributions made by people of diverse backgrounds. <i>Real-world contexts:</i> Biographies of minority and female scientists; histories of cultural contributions to science.	II.1.h.7 Describe the historical, political, and social factors affecting developments in science. <i>Key concepts:</i> Historical, political, social, and economic factors influencing the development of science. <i>Real-world contexts:</i> The development of the sun-centered model of the solar system and political pressures on Galileo; the development of Darwin's theory of evolution by natural selection.

<p>Draft Functional Independence Extended Benchmark</p> <p>Classroom/LEA/ISD</p>	<p>S.FI.R.RO.e.EB05 Develop an awareness of contributions made to science by people of diverse backgrounds and cultures.</p> <p><i>Key concepts:</i> Scientific contributions made by people of diverse cultures and backgrounds.</p> <p><i>Real-world contexts:</i> Teacher providing examples—people with disabilities (Stephen Hawking, Einstein, Christopher Reeve), Special Olympics.</p>	<p>S.FI.R.RO.m.EB06 Explore the contributions made in science by cultures and individuals of diverse backgrounds.</p> <p><i>Key concepts:</i> Cultural contributions to science, contributions made by people of diverse backgrounds.</p> <p><i>Real-world contexts:</i> Students using various resources, such as the Internet, biographies, periodicals.</p>	<p>S.FI.R.RO.h.EB06 Identify key developments in science.</p> <p><i>Key concepts:</i> Key discoveries in science.</p> <p><i>Real-world contexts:</i> Students using various resources, such as the Internet, biographies, periodicals.</p>
<p>Draft Supported Independence Extended Benchmark</p>			
<p>Draft Participation Extended Benchmark</p>			