

MEEA's "Not the Standards" Guides to the Missouri Learning Standards – Life Sciences (LS)

4 Core Ideas; 14 Components; 57 Learning Standards

Core Ideas > Components v	LS1 From Molecules to Organisms: Structures and Processes (22)	LS2 Ecosystems: Interactions, Energy and Dynamics (14)	LS3 Heredity: Inheritance and Variation of Traits (10)	LS4 Biological Evolution: Unity and Diversity (11)
A	Structure and Function (11)	Interdependent Relationships in Ecosystems (5)	Inheritance of Traits (3)	Evidence of Common Ancestry (3)
B	Growth and Development of Organisms (4)	Cycles of Matter and Energy Transfer in Ecosystems (5)	Natural Selection (5)	Natural Selection (4)
C	Organization for Matter and Energy Flow in Organisms (6)	Ecosystem Dynamics, Functioning and Resilience (4)	Adaptation (1)	Adaptation (3)
D	Information Processing (1)		Biodiversity and Humans (1)	

Learning Standards

Grade (# MLS)	LS1 From Molecules to Organisms: Structures and Processes				LS2 Ecosystems: Interactions, Energy, and Dynamics		
	A Structure and Function (11)	B Growth and Development of Organisms (4)	C Organization for Matter and Energy Flow in Organisms (6)	D Information Processing (1)	A Interdependent Relationships in Ecosystems (5)	B Cycles of Matter and Energy Transfer in Ecosystems (5)	C Ecosystems Dynamics, Functioning & Resilience (4)
K (1)			1. what plants/animals need to survive				
1 (2)	1. design solution to human problems by mimicking plant and animal structures						
2 (2)					1. plant growth under different conditions 2. animal model in seed dispersal or pollination		
3 (6)	1. structural adaptations for survival	1. life cycle comparisons					
4 (2)	1. internal & external structures for survival, reprod, growth			1. animal senses, information processing			
5 (3)	1. compare/contrast vertebrate organs, organ systems		1. plants grow from air and water (not soil)			1. plants turn matter into food used by consumers/decomposers/environment	
6-8 (16)	1. cell theory 2. cell structure 3. hierarchical org of multicellular orgs 4. system functions	1. reproductive structures 2. genetic/envirnon factors -> on growth	1. photosynthesis/cell respiration role in matter cycling/energy transfer in organisms		1. resource availability effect on individuals and pops 2. competition, predation, symbiosis	1. matter cycles and energy flows	1. how env changes affect populations 2. maintaining ecosystems
9-12 (25)	1. DNA structure -> protein structure 2. hierarchical organization of interact systems for multicellular organism functions 3. homeostasis through feedback	1. role of mitosis, cell division, differentiation in producing/maintainig organisms	1. how photosynthesis turns light into chemical energy 2. chemical/energy transfer in cell respiration 3. organic macromolecules from 6 elements (CHONSP)		1. how biotic/abiotic factors affect carrying capacity	1. photo-/chemosynthesis and aerobic/ anaerobic respiration -> matter cycling/energy flow 2. trophic pyramid 3. carbon cycle	1. ecosystem stability and change 2. helping maintain biodiversity

Learning Standards Continued

	LS3 Heredity: Inheritance and Variation of Traits (10)				LS4 Biological Evolution (11)		
Grade	A Inheritance of Traits (3)	B Natural Selection (5)	C Adaptation (1)	D Biodiversity and Humans (1)	A Evidence of Common Ancestry and Diversity (3)	B Natural Selection (4)	C Adaptation (4)
K							
1	1. young similar to adults						
2							
3	1. some traits from parents, some from environment	1. advantages of variation	1. advantages of traits depend on habitats	1. merits of solutions to problems caused by change in environment			
4							
5							
6 - 8					1. infer changes in environment from fossil record of extinction, evolution	1. variation in traits -> probability of passing traits on 2. genetic engineering	1. graphs to show natural selection affects traits' presence
9-12	1. relations of DNA, chromosomes, meiosis, fertilization	1. asexual/sexual reproduction : genetic information & variation 2. how mutations affect genes 3. heritable changes due to meiosis, replication mutations, environmental mutations 4. use statistics/probability to explain distribution of traits			1. how common ancestry and evolution well supported by evidence 2. embryological evidence for evolution	1. evolution from increase, variation, competition, proliferation 2. how statistics and probability support of evolution	1. natural selection -> evolution 2. changes in environment -> increase in populations, new species, extinction 3. mitigate adverse impacts of human activity on biodiversity

Symbols and Abbreviations

: proportional to, in relation to
 -> causes or has an effect on
 = equals
 / separating items on a list
 Δ change in or change

Goals of the MEEA NtS Guides

1. To help narrow the search for a specific standard with which a lesson aligns,
 2. to make connections and guide curriculum development for standards covered in the same grade,
 3. and to provide a map for the development of a concept from Kindergarten to High School so educators know how a concept fits into the big picture, and when might be the best time to teach it based on students' developmental ages.

How to Use the MEEA NtS Guides

1. If you have a lesson to teach, scan for the core idea, the component and then the learning standard that fits best – then look up the full standard description at <https://dese.mo.gov/college-career-readiness/curriculum/missouri-learning-standards>
 2. If you have an audience to teach, scan across its grade level to see which standards might line up with a lesson you have or would like to create – then look it up

NGSS Science and Engineering practices

1. ask questions and define problems
 2. develop and use models
 3. plan and carry out investigations/fair tests
 4. analyze and interpret data
 5. use mathematics and computational thinking
 6. construct explanations and design solutions CEDS
 7. engage in argument from evidence
 8. obtain, evaluate and communicate information

NGSS Cross Cutting Concepts

1. Patterns
 2. Cause and Effect: Mechanism and explanation
 3. Scale, Proportion and Quantity
 4. Systems and System Models
 5. Energy and Matter: Flows, cycles and conservation
 6. Structure and Function
 7. Stability and Change
<https://www.nextgenscience.org>

Socio-scientific Issues

SSI are complex, contested social questions with a scientific component. They provide an authentic opportunity to dig into science concepts. All environmental issues are SSI.
<https://serc.carleton.edu/sp/library/issues/what.html>

5 E Model – Engage, Explore, Explain, Elaborate, Evaluate - <https://bscs.org/bscs-5e-instructional-model>