AVENTA LEARNING

Alignment Document
State of Missouri and Aventa Learning Environmental Science

Environmental Science

2005-2007 Benchmark Blueprint

Strand	Goals	Standards	Benchmarks	Unit Name	Course Topic Description
4 Changes in Ecosystems and Interactions of Organisms with their Environments	**4.1** Organisms are interdependent with one another and with their environment	**4.1.A** All populations living together within a community interact with one another and with their environment in order to survive and maintain a balanced ecosystem	**4.1.A.a** Explain the nature of interactions between organisms in different symbiotic relationships (i.e., mutualism, commensalism, parasitism)		
			4.1.A.b Explain how cooperative (e.g., symbiosis) and competitive (e.g., predator/prey) relationships help maintain balance within an ecosystem		
			4.1.A.c Explain why no two species can occupy the same niche in a community		
		4.1.B Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite	**4.1.B.a** Identify and explain the limiting factors that may affect the carrying capacity of a population within an ecosystem	Populations	Understanding Populations
			4.1.B.b Predict how populations within an ecosystem change in number and/or structure in response to hypothesized changes in biotic and/or abiotic factors	Populations	Understanding Populations
		4.1.C All organisms, including humans, and their activities cause changes in their environment that affect the ecosystem	**4.1.C.a** Devise a multi-step plan to restore the stability and/or biodiversity of an ecosystem when given a scenario describing the possible adverse effects of human interactions with that ecosystem (e.g., destruction caused by direct harvesting, pollution, atmospheric		

			changes)		
			4.1.C.b Predict and explain how natural or human caused changes (biological, chemical and/or physical) in one ecosystem may affect other ecosystems due to natural mechanisms (e.g., global wind patterns, water cycle, ocean currents)		
		4.1.D The diversity of species within an ecosystem is affected by changes in the environment, which can be caused by other organisms or outside processes	**4.1.D.a** Predict the impact (beneficial or harmful) a natural environmental event (e.g., forest fire, flood, volcanic eruption, avalanche) may have on the diversity of different species in an ecosystem	Populations	Biodiversity
			4.1.D.b Describe possible causes of extinction of a population	Populations	Biodiversity
	4.2 Matter and energy flow through an ecosystem	**4.2.A** As energy flows through the ecosystem, all organisms capture a portion of that energy and transform it to a form they can use	**4.2.A.a** Illustrate and describe the flow of energy within a food web	Ecology	How Ecosystem's Work
			4.2.A.b Explain why there are generally more producers than consumers in an energy pyramid	Ecology	How Ecosystem's Work
			4.2.A.c Predict how energy distribution and energy use will be altered due to changes in a food web		
		4.2.B Matter is recycled through an ecosystem	**4.2.B.a** Explain the processes involved in the recycling of nitrogen, oxygen, and carbon through an ecosystem	Ecology	How Ecosystem's Work
			4.2.B.b Explain the importance of the recycling of nitrogen, oxygen, and carbon within an ecosystem	Ecology	How Ecosystem's Work
	4.3 Genetic variation sorted by the natural selection process explains evidence of biological evolution	**4.3.A** Evidence for the nature and rates of evolution can be found in anatomical and molecular	**4.3.A.a** Interpret fossil evidence to explain the relatedness of organisms using the principles of superposition and fossil correlation		
			4.3.A.b Evaluate the evidence that		

		characteristics of organisms and in the fossil record	supports the theory of biological evolution (e.g., fossil records, similarities between DNA and protein structures, similarities between developmental stages of organisms, homologous and vestigial structures)		
		4.3.B Reproduction is essential to the continuation of every species	**4.3.B.a** Define a species in terms of the ability to breed and produce fertile offspring	Ecology	The Organization of Life
			4.3.B.b Explain the importance of reproduction to the survival of a species (i.e., the failure of a species to reproduce will lead to extinction of that species)	Ecology	The Organization of Life
		4.3.C Natural selection is the process of sorting individuals based on their ability to survive and reproduce within their ecosystem	**4.3.C.a** Describe how variation in characteristics provides populations an advantage for survival		
			4.3.C.b Identify examples of adaptations that may have resulted from variations favored by natural selection (e.g., long-necked giraffes, long-eared jack rabbits)		
			4.3.C.c Explain how genetic homogeneity may cause a population to be more susceptible to extinction (e.g., succumbing to a disease for which there is no natural resistance)		
			4.3.C.d Explain how environmental factors (e.g., habitat loss, climate change, pollution, introduction of non-native species) can be agents of natural selection	Ecology	The Organization of Life
			4.3.C.e Given a scenario describing an environmental change, hypothesize why a given species was unable to survive		
7 Scientific Inquiry	**7.1** Science understanding is developed through the use of	**7.1.A** Scientific inquiry includes the	**7.1.A.a** Formulate testable questions and hypotheses		

	science process skills, scientific knowledge, scientific investigation, reasoning, and critical thinking	ability of students to formulate a testable question and explanation, and to select appropriate investigative methods in order to obtain evidence relevant to the explanation	**7.1.A.b** Analyzing an experiment, identify the components (i.e., independent variable, dependent variables, control of constants, multiple trials) and explain their importance to the design of a valid experiment		
			7.1.A.c Design and conduct a valid experiment		
			7.1.A.d Recognize it is not always possible, for practical or ethical reasons, to control some conditions (e.g., when sampling or testing humans, when observing animal behaviors in nature)		
			7.1.A.e Acknowledge some scientific explanations (e.g., explanations of astronomical or meteorological phenomena) cannot be tested using the standard experimental "scientific method" due to the limits of the laboratory environment, resources, and/or technologies		
			7.1.A.f Acknowledge there is no fixed procedure called "the scientific method", but that some investigations involve systematic observations, carefully collected and relevant evidence, logical reasoning, and some imagination in developing hypotheses and other explanations		
			7.1.A.g Evaluate the design of an experiment and make suggestions for reasonable improvements		
		7.1.B Scientific inquiry relies upon gathering evidence from qualitative and	**7.1.B.a** Make qualitative and quantitative observations using the appropriate senses, tools and equipment to gather data (e.g.,		

		quantitative observations	microscopes, thermometers, analog and digital meters, computers, spring scales, balances, metric rulers, graduated cylinders)		
			7.1.B.b Measure length to the nearest millimeter, mass to the nearest gram, volume to the nearest milliliter, force (weight) to the nearest Newton, temperature to the nearest degree Celsius, time to the nearest second		
			7.1.B.c Determine the appropriate tools and techniques to collect, analyze, and interpret data		
			7.1.B.d Judge whether measurements and computation of quantities are reasonable		
			7.1.B.e Calculate the range, average/mean, percent, and ratios for sets of data		
			7.1.B.f Recognize observation is biased by the experiences and knowledge of the observer (e.g., strong beliefs about what should happen in particular circumstances can prevent the detection of other results)		
		7.1.C Evidence is used to formulate explanations	**7.1.C.a** Use quantitative and qualitative data as support for reasonable explanations (conclusions)		
			7.1.C.b Analyze experimental data to determine patterns, relationship, perspectives, and credibility of explanations (e.g., predict/extrapolate data, explain the relationship between the independent and dependent variable)		
			7.1.C.c Identify the possible effects of		

			errors in observations, measurements, and calculations, on the validity and reliability of data and resultant explanations (conclusions)		
		7.1.D Scientific inquiry includes evaluation of explanations (hypotheses, laws, theories) in light of scientific principles (understandings)	**7.1.D.a** Analyze whether evidence (data) and scientific principles support proposed explanations (hypotheses, laws, theories)		
			7.1.D.b Evaluate the reasonableness of an explanation (conclusion)		
		7.1.E The nature of science relies upon communication of results and justification of explanations	**7.1.E.a** Communicate the procedures and results of investigations and explanations through:		
			7.1.E.a.1 oral presentations		
			7.1.E.a.2 drawings and maps		
			7.1.E.a.3 data tables (allowing for the recording and analysis of data relevant to the experiment such as independent and dependent variables, multiple trials, beginning and ending times or temperatures, derived quantities)		
			7.1.E.a.4 graphs (bar, single, and multiple line)		
			7.1.E.a.5 equations and writings		
			7.1.E.b Communicate and defend a scientific argument		
			7.1.E.c Explain the importance of the public presentation of scientific work and supporting evidence to the scientific community (e.g., work and evidence must be critiqued, reviewed, and validated by peers; needed for subsequent investigations by peers; results can influence the decisions		

			regarding future scientific work)		
8 Impact of Science, Technology and Human Activity	**8.1** The nature of technology can advance, and is advanced by, science as it seeks to apply scientific knowledge in ways that meet human needs	**8.1.A** Designed objects are used to do things better or more easily and to do some things that could not otherwise be done at all	Not assessed at this level		
		8.1.B Advances in technology often result in improved data collection and an increase in scientific information	**8.1.B.a** Recognize the relationships linking technology and science (e.g., how technological problems may create a demand for new science knowledge, how new technologies make it possible for scientists to extend research and advance science)		
		8.1.C Technological solutions to problems often have drawbacks as well as benefits	**8.1.C.a** Identify and evaluate the drawbacks (e.g., design constraints, unintended consequences, risks) and benefits of technological solutions to a given problem (e.g., damming a river for flood control, using pesticides to eliminate mosquitoes, genetic engineering of cells, use of satellite communications to gather information)		
	8.2 Historical and cultural perspectives of scientific explanations help to improve understanding of the nature of science and how science knowledge and technology evolve over time	**8.2.A** People of different gender and ethnicity have contributed to scientific discoveries and the invention of technological innovations	**8.2.A.a** Recognize contributions to science are not limited to the work of one particular group, but are made by a diverse group of scientists representing various ethnic and gender groups		
			8.2.A.b Recognize gender and ethnicity of scientists often influence the questions asked and/or the methods used in scientific research and may limit or advance science knowledge and/or technology		
		8.2.B Scientific	**8.2.B.a** Identify and describe how		

		theories are developed based on the body of knowledge that exists at any particular time and must be rigorously questioned and tested for validity	explanations (hypotheses, laws, theories) of scientific phenomena have changed over time as a result of new evidence (e.g., model of the solar system, basic structure of matter, structure of an atom, Theory of Plate Tectonics, Big Bang and nebular theory of the Universe, explanation of electric current)		
			8.2.B.b Identify and analyze current theories that are being questioned, and compare them to new theories that have emerged to challenge older ones (e.g., Theory of Evolution, theories of extinction, global warming)		
	8.3 Science and technology affect, and are affected by, society	**8.3.A** People, alone or in groups, are always making discoveries about nature and inventing new ways to solve problems and get work done	Not assessed at this level		
		8.3.B Social, political, economic, ethical and environmental factors strongly influence, and are influenced by, the direction of progress of science and technology	**8.3.B.a** Analyze the roles of science and society as they interact to determine the direction of scientific and technological progress (e.g., prioritization of and funding for new scientific research and technological development is determined on the basis of individual, political and social values and needs; understanding basic concepts and principles of science and technology influences debate about the economics, policies, politics, and ethics of various scientific and technological challenges)	Our Health and Our Future	Economics, Policy and the Future

			8.3.B.b Identify and describe major scientific and technological challenges to society and their ramifications for public policy (e.g., global warming, limitations to fossil fuels, genetic engineering of plants, space and/or medical research)	Our Health and Our Future	Economics, Policy and the Future
			8.3.B.c Analyze and evaluate the social, political, economic, ethical, and environmental factors affecting progress toward meeting major scientific and technological challenges (e.g., limitations placed on stem-cell research or genetic engineering, introduction of alien species, deforestation, bioterrorism, nuclear energy, genetic counseling, computer technology)		
		8.3.C Scientific ethics require that scientists must not knowingly subject people or the community to health or property risks without their knowledge and consent	**8.3.C.a** Identify and evaluate the need for informed consent in experimentation		
			8.3.C.b Identify the ethical issues involved in experimentation (i.e., risks to organisms or environment)		
			8.3.C.c Identify and evaluate the role of models as an ethical alternative to direct experimentation (e.g., using a model for a stream rather than pouring oil in an existing stream when studying the effects of oil pollution)		
		8.3.D Scientific information is presented through a number of credible sources, but is at times influenced in such a way to become non-	**8.3.D.a** Evaluate a given source for its scientific credibility (e.g., articles in a new periodical quoting an "eye witness", a scientist speaking within or outside his/her area of expertise)		
			8.3.D.b Explain why accurate record-keeping, openness, and replication are essential for maintaining an		

		credible	investigator's credibility with other scientists and society		