

Aquatic Science Side-by-Side



2021 Knowledge and Skill Statement/Student Expectation	2021 Text	2017 Knowledge and Skill Statement/Student Expectation	2017 Text	Notes from TEA Staff
SCIENCE.AQUA.1	Scientific and engineering practices . The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models . The student is expected to:	AQUA.1	Scientific processes . The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices . The student is expected to:	
SCIENCE.AQUA.1.A	ask questions and define problems based on observations or information from text, phenomena, models, or investigations;	AQUA.2.E	plan and implement investigative procedures, including asking questions, formulating testable hypotheses, and selecting, handling, and maintaining appropriate equipment and technology;	
SCIENCE.AQUA.1.B	apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;	AQUA.2	Scientific processes. The student uses scientific methods during laboratory and field investigations. The student is expected to:	
SCIENCE.AQUA.1.C	use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;	AQUA.1.A	demonstrate safe practices during laboratory and field investigations, including chemical, electrical, and fire safety, and safe handling of live and preserved organisms; and	
SCIENCE.AQUA.1.D	use appropriate tools such as Global Positioning System (GPS), Geographic Information System (GIS), weather balloons, buoys, water testing kits, meter sticks, metric rulers, pipettes, graduated cylinders, standard laboratory glassware, balances, timing devices, pH meters or probes, various data collecting probes, thermometers, calculators, computers, Internet access, turbidity testing devices, hand magnifiers, work and disposable gloves, compasses, first aid kits, field guides, water quality test kits or probes, 30-meter tape measures, tarps, ripple tanks, trowels, screens, buckets, sediment samples equipment, cameras, flow meters, cast nets, kick nets, seines, computer models, spectrophotometers, stereomicroscopes, compound microscopes, clinometers, and field journals, various prepared slides, hand lenses, hot plates, Petri dishes, sampling nets, waders, leveling grade rods (Jason sticks), protractors, inclination and height distance calculators, samples of biological specimens or structures, core sampling equipment, fish tanks and associated supplies, and hydrometers;	AQUA.2.G	demonstrate the use of course apparatuses, equipment, techniques, and procedures;	
SCIENCE.AQUA.1.E	collect quantitative data using the International System of Units (SI) and qualitative data as evidence;	AQUA.2.F	collect data individually or collaboratively, make measurements with precision and accuracy, record values using appropriate units, and calculate statistically relevant quantities to describe data, including mean, median, and range;	
SCIENCE.AQUA.1.F	organize quantitative and qualitative data using probeware, spreadsheets, lab notebooks or journals, models, diagrams, graphs paper, computers, or cellphone applications;			
SCIENCE.AQUA.1.G	develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and	AQUA.2.H	organize, analyze, evaluate, build models, make inferences, and predict trends from data;	
SCIENCE.AQUA.1.H	distinguish between scientific hypotheses, theories, and laws .	AQUA.2.D	distinguish between scientific hypotheses and scientific theories;	
		AQUA.2.B	know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories;	

		AQUA.2.C	know that scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but they may be subject to change as new areas of science and new technologies are developed;	
		AQUA.1.B	demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials;	Conservation of resources is covered in elementary and middle school.
		AQUA.2.A	know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;	
SCIENCE.AQUA.2	<u>Scientific and engineering practices. The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:</u>			
SCIENCE.AQUA.2.A	<u>identify advantages and limitations of models such as their size, scale, properties, and materials;</u>			
SCIENCE.AQUA.2.B	<u>analyze data by identifying significant statistical features, patterns, sources of error, and limitations;</u>			
SCIENCE.AQUA.2.C	<u>use mathematical calculations to assess quantitative relationships in data; and</u>	AQUA.2.I	perform calculations using dimensional analysis, significant digits, and scientific notation; and	
SCIENCE.AQUA.2.D	<u>evaluate experimental and engineering designs.</u>			
SCIENCE.AQUA.3	<u>Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:</u>	AQUA.3	Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:	
SCIENCE.AQUA.3.A	<u>develop explanations and propose solutions supported by data and models consistent with scientific ideas, principles, and theories;</u>	AQUA.3.C	draw inferences based on data related to promotional materials for products and services;	
SCIENCE.AQUA.3.B	communicate <u>explanations and solutions individually and collaboratively in a variety of settings and formats; and</u>	AQUA.2.J	communicate valid conclusions using essential vocabulary and multiple modes of expression such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.	Students are now being asked to communicate not only as scientists but also as engineers.
		AQUA.3.B	communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;	
SCIENCE.AQUA.3.C	<u>engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.</u>			
SCIENCE.AQUA.4	<u>Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. The student is expected to:</u>			
SCIENCE.AQUA.4.A	analyze, evaluate, and critique scientific explanations and <u>solutions</u> by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student;	AQUA.3.A	in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;	
SCIENCE.AQUA.4.B	<u>relate</u> the impact of <u>past and current</u> research on scientific thought and society, <u>including research methodology, cost-benefit analysis,</u> and contributions of <u>diverse</u> scientists <u>as related to the content; and</u>	AQUA.3.D	evaluate the impact of research <u>and technology</u> on scientific thought, society, <u>and the environment;</u>	
		AQUA.3.F	research and describe the history of aquatic science and contributions of scientists.	

SCIENCE.AQUA.4.C	research and explore resources such as museums, planetariums, observatories, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field in order to investigate STEM careers.	AQUA.3.E	describe the connection between aquatic science and future careers; and	
SCIENCE.AQUA.5	The student understands how the properties of water build the foundation of aquatic ecosystems. The student is expected to:			
SCIENCE.AQUA.5.A	describe how the shape and polarity of the water molecule make it a "universal solvent" in aquatic systems;			
SCIENCE.AQUA.5.B	identify how aquatic ecosystems are affected by water's properties of adhesion, cohesion, surface tension, heat capacity, and thermal conductivity; and			
SCIENCE.AQUA.5.C	explain how the density of water is critical for organisms in cold environments.			
SCIENCE.AQUA.6	Students know that aquatic environments are the product of interactions among Earth systems. The student is expected to:	AQUA.4	Science concepts. Students know that aquatic environments are the product of Earth systems interactions. The student is expected to:	
SCIENCE.AQUA.6.A	identify key features and characteristics of atmospheric, geological, hydrological, and biological systems as they relate to aquatic environments;	AQUA.4.A	identify key features and characteristics of atmospheric, geological, hydrological, and biological systems as they relate to aquatic environments;	
SCIENCE.AQUA.6.B	describe the interrelatedness of atmospheric, geological, hydrological, and biological systems in aquatic ecosystems, including positive and negative feedback loops ; and	AQUA.4.B	apply systems thinking to the examination of aquatic environments, including positive and negative feedback cycles; and	
SCIENCE.AQUA.6.C	evaluate environmental data using technology such as maps, visualizations, satellite data, Global Positioning System (GPS), Geographic Information System (GIS), weather balloons, and buoys to model the interactions that affect aquatic ecosystems.	AQUA.4.C	collect and evaluate global environmental data using technology such as maps, visualizations, satellite data, Global Positioning System (GPS), Geographic Information System (GIS), weather balloons, buoys, etc.	
SCIENCE.AQUA.7	The student knows about the interdependence and interactions that occur in aquatic environments. The student is expected to:	AQUA.11	Science concepts- The student knows about the interdependence and interactions that occur in aquatic environments. The student is expected to:	
SCIENCE.AQUA.7.A	identify how energy flows and matter cycles through both freshwater and marine aquatic systems, including food webs, chains, and pyramids;	AQUA.11.A	identify how energy flows and matter cycles through both fresh water and salt water aquatic systems, including food webs, chains, and pyramids; and	
SCIENCE.AQUA.7.B	identify biological, chemical, geological, and physical components of an aquatic life zone as they relate to the organisms in it;			
SCIENCE.AQUA.7.C	identify variables that affect the solubility of carbon dioxide and oxygen in water;			
SCIENCE.AQUA.7.D	evaluate factors affecting aquatic population cycles such as lunar cycles, temperature variations, hours of daylight, and predator-prey relationships; and	AQUA.11.B	evaluate the factors affecting aquatic population cycles.	
SCIENCE.AQUA.7.E	identify the interdependence of organisms in an aquatic environment such as in a pond, a river, a lake, an ocean, or an aquifer and the biosphere.	AQUA.5.D	identify the interdependence of organisms in an aquatic environment such as in a pond, river, lake, ocean, or aquifer and the biosphere.	
SCIENCE.AQUA.8	The student conducts short-term and long-term studies on local aquatic environments. Local natural environments are to be preferred over artificial or virtual environments. The student is expected to:	AQUA.5	Science concepts- The student conducts long-term studies on local aquatic environments. Local natural environments are to be preferred over artificial or virtual environments. The student is expected to:	
SCIENCE.AQUA.8A	evaluate data over a period of time from an established aquatic environment documenting seasonal changes and the behavior of organisms;	AQUA.5.A	evaluate data over a period of time from an established aquatic environment documenting seasonal changes and the behavior of organisms;	

SCIENCE.AQUA.8.B	collect <u>and analyze</u> pH, salinity, temperature, mineral content, nitrogen compounds, <u>dissolved oxygen</u> , and turbidity <u>data periodically, starting with</u> baseline <u>measurements; and</u>	AQUA.5.B	collect baseline <u>quantitative data</u> ; including pH, salinity, temperature, mineral content, nitrogen compounds, and turbidity <u>from an aquatic environment</u> ;	
SCIENCE.AQUA.8.C	<u>use data from short-term or long-term studies to</u> analyze interrelationships <u>between</u> producers, consumers, and decomposers in aquatic ecosystems.	AQUA.5.C	analyze interrelationships <u>among</u> producers, consumers, and decomposers in a <u>local</u> aquatic ecosystem; and	
SCIENCE.AQUA.9	The student knows the role of cycles in an aquatic environment. The student is expected to:	AQUA.6	<u>Science concepts</u> . The student knows the role of cycles in an aquatic environment. The student is expected to:	
SCIENCE.AQUA.9.A	identify the role of carbon, nitrogen, water, and nutrient cycles in an aquatic environment, including upwellings and turnovers;	AQUA.6.A	identify the role of carbon, nitrogen, water, and nutrient cycles in an aquatic environment, including upwellings and turnovers; and	
SCIENCE.AQUA.9.B	examine the interrelationships between aquatic systems and climate and weather, including El Niño and La Niña, currents, and hurricanes; and	AQUA.6.B	examine the interrelationships between aquatic systems and climate and weather, including El Niño and La Niña, currents, and hurricanes.	
SCIENCE.AQUA.9.C	<u>explain how tidal cycles influence intertidal ecology</u> .			
SCIENCE.AQUA.10	The student knows the origin and <u>potential</u> uses of <u>fresh</u> water. The student is expected to:	AQUA.7	<u>Science concepts</u> . The student knows the origin and use <u>of water in a watershed</u> . The student is expected to:	
SCIENCE.AQUA.10.A	identify sources of water in a watershed, including rainfall, groundwater, and surface water;	AQUA.7.A	identify sources <u>and determine the amounts</u> of water in a watershed, including rainfall, groundwater, and surface water;	
SCIENCE.AQUA.10.B	identify factors that contribute to how water flows through a watershed;	AQUA.7.B	identify factors that contribute to how water flows through a watershed; and	
SCIENCE.AQUA.10.C	<u>analyze</u> water quantity and quality in a local watershed <u>or aquifer; and</u>	AQUA.7.C	<u>identify</u> water quantity and quality in a local watershed.	
SCIENCE.AQUA.10.D	<u>describe human uses of fresh water and how human freshwater use competes with that of other organisms</u> .			
SCIENCE.AQUA.11	The student knows that geological phenomena and fluid dynamics affect aquatic systems. The student is expected to:	AQUA.8	<u>Science concepts</u> . The student knows that geological phenomena and fluid dynamics affect aquatic systems. The student is expected to:	
SCIENCE.AQUA.11.A	<u>examine</u> basic principles of fluid dynamics, including hydrostatic pressure, density <u>as a result of</u> salinity, and buoyancy;	AQUA.8.A	<u>demonstrate</u> basic principles of fluid dynamics, including hydrostatic pressure, density, salinity, and buoyancy;	
SCIENCE.AQUA.11.B	identify interrelationships between ocean currents, climates, and geologic features <u>such as continental margins, active and passive margins, abyssal plains, island atolls, peninsulas, barrier islands, and hydrothermal vents</u> ;	AQUA.8.B	identify interrelationships between ocean currents, climates, and geologic features; and	
SCIENCE.AQUA.11.C	explain <u>how</u> fluid dynamics <u>causes</u> upwelling and lake turnover; and	AQUA.8.C	<u>describe and</u> explain fluid dynamics in an upwelling and lake turnover.	
SCIENCE.AQUA.11.D	<u>describe how erosion and deposition in river systems lead to formation of geologic features</u> .			
SCIENCE.AQUA.12	The student <u>understands</u> the types of aquatic ecosystems. The student is expected to:	AQUA.9	<u>Science concepts</u> . The student <u>knows</u> the types and <u>components</u> of aquatic ecosystems. The student is expected to:	
SCIENCE.AQUA.12.A	differentiate among freshwater, brackish, and <u>marine</u> ecosystems; and	AQUA.9.A	differentiate among freshwater, brackish, and <u>saltwater</u> ecosystems;	
SCIENCE.AQUA.12.B	identify <u>the major properties and</u> components of <u>different marine and freshwater</u> life zones.	AQUA.9.B	identify the major properties and components of different marine and freshwater life zones; and	
		AQUA.9.C	identify <u>biological, chemical, geological, and physical</u> components of <u>an aquatic</u> life zone <u>as they relate to the organisms in it</u> .	

SCIENCE.AQUA.13	The student knows environmental adaptations of aquatic organisms. The student is expected to:	AQUA.10	Science concepts- The student knows environmental adaptations of aquatic organisms. The student is expected to:	
SCIENCE.AQUA.13.A	<u>compare</u> different <u>traits in</u> aquatic organisms using tools such as dichotomous keys;	AQUA.10.A	classify different aquatic organisms using tools such as dichotomous keys;	
SCIENCE.AQUA.13.B	describe how adaptations allow an organism to exist within an aquatic environment; and	AQUA.10.B	compare and describe how adaptations allow an organism to exist within an aquatic environment; and	
SCIENCE.AQUA.13.C	compare adaptations of freshwater and marine organisms.	AQUA.10.C	compare differences in adaptations of aquatic organisms to fresh water and marine environments-	
SCIENCE.AQUA.14	The student understands how human activities impact aquatic environments. The student is expected to:	AQUA.12	Science concepts- The student understands how human activities impact aquatic environments. The student is expected to:	
SCIENCE.AQUA.14.A	analyze the cumulative impact of human population growth on an aquatic <u>ecosystem</u> ;	AQUA.12.B	analyze the cumulative impact of human population growth on an aquatic system ;	
SCIENCE.AQUA.14.B	predict effects of chemical, organic, physical, and thermal changes <u>due to</u> humans on the living and nonliving components of an aquatic ecosystem;	AQUA.12.A	predict effects of chemical, organic, physical, and thermal changes from humans on the living and nonliving components of an aquatic ecosystem;	
SCIENCE.AQUA.14.C	investigate the role of humans in unbalanced systems <u>involving phenomena</u> such as invasive species, fish farming, cultural eutrophication, or red tides;	AQUA.12.C	investigate the role of humans in unbalanced systems such as invasive species, fish farming, cultural eutrophication, or red tides;	
SCIENCE.AQUA.14.D	analyze and discuss how human activities such as fishing, transportation, dams, and recreation influence aquatic environments;	AQUA.12.D	analyze and discuss how human activities such as fishing, transportation, dams, and recreation influence aquatic environments; and	
SCIENCE.AQUA.14.E	<u>describe</u> the impact <u>such as costs and benefits</u> of various laws and policies such as The Endangered Species Act, right of capture laws, or Clean Water Act on aquatic systems; and	AQUA.12.E	understand the impact of various laws and policies such as The Endangered Species Act, right of capture laws, or Clean Water Act on aquatic systems.	
SCIENCE.AQUA.14.F	<u>analyze the purpose and effectiveness of human efforts to restore aquatic ecosystems affected by human activities.</u>			
KEY	<u>Blue double underline: indicates content new to the grade level</u>	Orange strike through: indicates content was deleted-		