Environmental Science Institute
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Edwards Aquifer

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This file contains suggestions for how to incorporate the material from this CD-ROM into curriculum using the Texas Essential Knowledge and Skills for Science.

Elementary School

§112.2. Science Kindergarten

(K.2) Scientific processes. The student develops abilities necessary to do scientific inquiry in the field and the classroom. The student is expected to:

(A) Ask questions about organisms, objects, and events; [Why does the salamander in slide 58 have the characteristics that it does, i.e. colorless, blind, etc…? Does it have to do with its habitat?]

(B) Plan and conduct simple descriptive investigations; [Investigate descriptively what a natural spring looks like from slides 42-46.]

(K.9) Science concepts. The student knows that living organisms have basic needs. The student is expected to:

(A) Identify basic needs of living organisms; [What are the basic needs of the Austin Blind Salamander with respect to water? Can the salamander survive on less water due to the demand of it for other uses? Slides 36, 58, 65, 67]

(K.10) Science concepts. The student knows that the natural world includes rocks, soil, and water. The student is expected to:

(A) Observe and describe properties of rocks, soil, and water; and [Slide 14 shows the age of and the environment in which the Edwards Aquifer was formed. Describe the properties of the different rock types and formations of the aquifer using slides 18-23.]

(B) Give examples of ways that rocks, soil, and water are useful. [Slide 26 shows how useful soil and rocks are. They are the tools we use to study the past. Slides 51-55, 68, 75 show how and to whom the water from the Edwards Aquifer is useful]

§112.3. Science Grade 1

(1.2) Scientific processes. The student develops abilities necessary to do scientific inquiry in the field and the classroom. The student is expected to:

(A) Ask questions about organisms, objects, and events; [Why does the salamander have the characteristics that it does, i.e. colorless, blind, etc…? Does it have to do with its habitat? Slides 58, 64]

(B) Plan and conduct simple descriptive investigations; [Investigate descriptively what a natural spring looks like from slides 42-46.]

(1.9) Science concepts. The student knows that living organisms have basic needs. The student is expected to:

(A) Identify characteristics of living organisms that allow their basic needs to be met; and [What are the basic needs of the Austin Blind Salamander with respect to water? Can the salamander survive on less water due to the demand of it for other uses? 58, 67]

(1.10) Science concepts. The student knows that the natural world includes rocks, soil, and water. The student is expected to:

(A) Identify and describe a variety of natural sources of water including streams, lakes, and oceans; [Slides 7, 36, 51-55 explain what an aquifer is and how it is useful to different sources.]

(B) Observe and describe differences in rocks and soil samples; and [Slide 14 shows the age of and the environment in which the Edwards Aquifer was formed. Describe the properties of the different rock types and formations of the aquifer using slides 18-23.]

(C) Identify how rocks, soil, and water are used and how they can be recycled. [Slide 26 shows uses of soil and rocks. They are the tools we use to study the past. Slides 51-55 show how water is useful from the Edwards Aquifer and who uses the water. Water is added to the aquifer through recharge zones. 36, 38-40.]

§112.4. Science Grade 2

(2.2) Scientific processes. The student develops abilities necessary to do scientific inquiry in the field and the classroom. The student is expected to:

(A) Ask questions about organisms, objects, and events; [Why does the salamander have the characteristics that it does, i.e. colorless, blind, etc…? Does it have to do with its habitat? 58, 64]

(B) Plan and conduct simple descriptive investigations; [Investigate descriptively what a natural spring looks like from slides 42-46.]

(2.9) Science concepts. The student knows that living organisms have basic needs. The student is expected to:

(B) Compare and give examples of the ways living organisms depend on each other and on their environments. [Slides 58, 63, 65 explain that the environment in which these organisms live is the Edwards Aquifer and they depend on clean water.]

(2.10) Science concepts. The student knows that the natural world includes rocks, soil, water, and gases of the atmosphere. The student is expected to:

(A) Describe and illustrate the water cycle; and [Describe how precipitation recharges the aquifer, flows through the aquifer, discharges from the aquifer, evaporates sometime after reaching the surface, and then is precipitated once again. 26, 36-48, 50]

(B) Identify uses of natural resources. [Using slides 7, 36, 51-55, explain what the Edwards Aquifer is and how it is an important source of water for municipal, agricultural, and industrial needs.]

§112.5. Science Grade 3

(3.2) Scientific processes. The student uses scientific inquiry methods during field and laboratory investigations. The student is expected to:

(A) Plan and implement descriptive investigations including asking well-defined questions, formulating testable hypotheses, and selecting and using equipment and technology; [Investigate descriptively what a natural spring looks like from slides 42-46. Formulate hypotheses on how water gets in the aquifer. 26, 36]

(B) Collect information by observing and measuring; [In slides 15, 18-23 observe each picture and hypothesize how theses rocks formed.]

(3.8) Science concepts. The student knows that living organisms need food, water, light, air, a way to dispose of waste, and an environment in which to live. The student is expected to:

(A) Observe and describe the habitats of organisms within an ecosystem; [In slides 29, 64, 42-46 observe the habitats of organisms that live around or within the Edwards Aquifer or a natural spring.]

(C) Describe environmental changes in which some organisms would thrive, become ill, or perish; and [Use slides 58, 63, 65 for an example of an organism that would perish if the Edwards Aquifer did not supply the springs with water.]

§112.6. Science Grade 4

(4.2) Scientific processes. The student uses scientific inquiry methods during field and laboratory investigations. The student is expected to:

(A) Plan and implement descriptive investigations including asking well-defined questions, formulating testable hypotheses, and selecting and using equipment and technology; [Descriptively investigate what a natural spring looks like from slides 42-46. Formulate hypotheses on how water recharges the Edwards Aquifer.]

(B) Collect information by observing and measuring; [In slides 15, 18-23, 38-40, 42-46 observe each picture and hypothesize how theses rocks formed.]

(4.10) Science concepts. The student knows that certain past events affect present and future events. The student is expected to:

(A) Identify and observe effects of events that require time for changes to be noticeable including growth, erosion, dissolving, weathering, and flow; and [In slide 28 erosion has occurred over time. This is a good diagram help students understand the concept of erosion.]

(B) Draw conclusions about "what happened before" using fossils or charts and tables. [Slide 25 can be used to show "what happened before" with the footprints left by dinosaurs. Slide 15 can also be used to show that organisms lived thousands of years ago because of the fossils that have been found.]

§112.7. Science Grade 5

(5.2) Scientific processes. The student uses scientific methods during field and laboratory investigations. The student is expected to:

(A) Plan and implement descriptive and simple experimental investigations including asking well-defined questions, formulating testable hypotheses, and selecting and using equipment and technology; [Investigate descriptively what a natural spring looks like from slides 42-46. Use slide 36 for knowledge and have the student formulate hypotheses on how water recharges the aquifer. Using slide 26 discuss how caves formed underground.]

(B) Collect information by observing and measuring; [In slides 15, 18-23 observe each picture and hypothesize how theses rocks formed.]

(C) Analyze and interpret information to construct reasonable explanations from direct and indirect evidence; [Using slides 8-12 analyze what the Edwards Aquifer is and where it is located.]

(5.5) Science concepts. The student knows that a system is a collection of cycles, structures, and processes that interact. The student is expected to:

(A) Describe some cycles, structures, and processes that are found in a simple system; and [A cycle exist in the water flow of the Edwards Aquifer. Use slides 26, 36-40, 42-46, 48 to discuss how water enters the aquifer, how water exits the aquifer, and how the cycle continues infinitely.]

(5.9) Science concepts. The student knows that adaptations may increase the survival of members of a species. The student is expected to:

(B) Analyze and describe adaptive characteristics that result in an organism's unique niche in an ecosystem; and [Slide 58 clearly shows a unique characteristic of the Austin Blind Salamander and how this characteristic is connected to the environment of Edwards Aquifer.]

(5.11) Science concepts. The student knows that certain past events affect present and future events. The student is expected to:

(A) Identify and observe actions that require time for changes to be measurable, including growth, erosion, dissolving, weathering, and flow; [In slides 24-28, erosion has occurred over time due to many different causes. These are good photos to help students understand the concept of erosion.]

(B) Draw conclusions about "what happened before" using data such as from tree-growth rings and sedimentary rock sequences; and [Slide 25 can be used to show "what happened before" with the footprints left by dinosaurs. Slide 15 can also be used to show that organisms lived thousands of years ago because of the fossils that have been found.]

MIDDLE SCHOOL

§112.22. Science Grade 6

(6.2) Scientific processes. The student uses scientific inquiry methods during field and laboratory investigations. The student is expected to:

(A) Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting and using equipment and technology; [Descriptively investigate what a natural spring looks like from slides 42-46. Use slide 36 to have students formulate hypotheses on how water recharges the Edwards Aquifer. Using slides 22 discuss how caves formed underground and how there exist underground drainages.]

(B) Collect data by observing and measuring; [In slides 15 and 18-23 observe each picture and hypothesize how theses rocks formed.]

(6.5) Scientific concepts. The student knows that systems may combine with other systems to form a larger system. The student is expected to:

(A) Identify and describe a system that results from the combination of two or more systems such as in the solar system; and [What earth systems combine to form the Edwards Aquifer? 7, 14-23, 31, 36-40, 42-46, 50, 58, 63, 65]

(B) Describe how the properties of a system are different from the properties of its parts [What are the properties of the rocks that make up the Edwards Aquifer? What properties do all of the rocks have in common? What properties differ among the rocks? 15-23, 27]

(6.6) Science concepts. The student knows that there is a relationship between force and motion. The student is expected to:

(C) Identify forces that shape features of the Earth including uplifting, movement of water, and volcanic activity [What forces have affected the formation of the Edwards Aquifer? In what way have these forces shaped and constructed the aquifer? Slides 14, 24-29, 51, 67. Compare the time scale of the events and processes that have influenced the formation of the aquifer (for example, compare the impact and timing of acid dissolution in slide 26, with the impact and timing of excessive pumping in slides 48, 63-65).]

(6.7) Science concepts. The student knows that substances have physical and chemical properties. The student is expected to:

(A) Demonstrate that new substances can be made when two or more substances are chemically combined and compare the properties of the new substances to the original substances; and [Use slide 26 as an example of how substances come together to form new substances.]

(6.12) Science concepts. The student knows that the responses of organisms are caused by internal or external stimuli. The student is expected to:

(C) Identify components of an ecosystem to which organisms may respond [What are some of the components of the Edwards Aquifer ecosystem (slides 14-23, 38-42, 37, 42-46, 63-65)? How have people using the aquifer changed those components (slides 48, 50, 51-55)? What has been the response of the ecosystem (slides 63-67)?]

(6.14) Science concepts. The student knows the structures and functions of Earth systems. The student is expected to:

(A) Summarize the rock cycle; [Summarize the hydrologic cycle.]

(B) Identify relationships between groundwater and surface water in a watershed; and [What is a watershed? Have students locate their watersheds at the USGS 'Know Your Watershed' site (http://www.ctic.purdue.edu/KYW/KYW.html). What is a recharge zone? Do all watersheds include recharge features?]

§112.23. Science Grade 7

(7.2) Scientific processes. The student uses scientific inquiry methods during field and laboratory investigations. The student is expected to:

(A) Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting and using equipment and technology; [Investigate what a natural spring looks like from slides 42-46. Using slide 36, have the student formulate hypotheses on how water recharges the Edwards Aquifer. Using slide 26, discuss how caves formed underground and how there exist underground drainages.]

(B) Collect data by observing and measuring; [In slides 15 and 18-23 observe each picture and hypothesize how theses rocks formed.]

(7.12) Science concepts. The student knows that there is a relationship between organisms and the environment. The student is expected to:

(C) Describe how different environments support different varieties of organisms; and [Slide 58 shows a salamander that you would not usually see. Does the Austin Blind Salamander's environment differ from other salamanders? Do the salamander's characteristics have to do with the environment that it lives in?]

(7.14) Science concepts. The student knows that natural events and human activity can alter Earth systems. The student is expected to:

(B) Analyze effects of regional erosional deposition and weathering; and [Refer to slide 26. Discuss how water, along with a few chemicals, is the key to the development of underground drainage systems. When water mixes with these chemicals it dissolves the ground, forms drainages, and it cycles over and over again.
Refer to: http://esa.www5.50megs.com/geopro/karst/karst.html]

(C) Make inferences and draw conclusions about effects of human activity on Earth's renewable, non-renewable, and inexhaustible resources. [Is water a renewable, non-renewable, or inexhaustible resource? As the population grows, do we have enough water to satisfy everyone's wants and needs? Have a discussion about this question and have students make inferences on the topic.]

§112.24. Science Grade 8

(8.2) Scientific processes. The student uses scientific inquiry methods during field and laboratory investigations. The student is expected to:

(A) Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting and using equipment and technology; [Investigate what a natural spring looks like from slides 42-46 and how it is different from other water sources. Formulate hypotheses on how water recharges the Edwards Aquifer. Discuss how Edwards Aquifer was formed. Slides 24-29]

(B) Collect data by observing and measuring; [In slides 42-46, 15, 18-23 observe each picture and hypothesize how these rocks formed. What leads to the formation of these rocks?]

(8.9) Science concepts. The student knows that substances have chemical and physical properties. The student is expected to:

(A) Demonstrate that substances may react chemically to form new substances; [Use slide 26 for an example of how substances come together to form new substances.]

High School

§112.42. Integrated Physics and Chemistry

(2) Scientific processes. The student uses scientific methods during field and laboratory investigations. The student is expected to:

(A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology; [Use slide 36 as a graphical representation of the formation and have the student formulate hypotheses on how water gets into the Edwards Aquifer. Using slide 26 discuss how caves formed underground and how there exist underground drainages. Slide 26 shows all the chemicals that were involved with the formation of theses drainages.]

(8) Science concepts. The student knows that changes in matter affect everyday life. The student is expected to:

(A) distinguish between physical and chemical changes in matter such as oxidation, digestion, changes in states, and stages in the rock cycle; [Discuss using slide 26, 38-40, 42-46 which locations may have had chemical or physical changes. In slides 18-23 did theses rocks undergo physical or chemical changes throughout the rock cycle?]

§112.43. Biology

(2) Scientific processes. The student uses scientific methods during field and laboratory investigations. The student is expected to:

(A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology; [Discuss the different types of species that live in or around the springs. Use the slides 58, 63 for pictures of species. Discuss and investigate the characteristics of species to find any similarities between them.]

(12) Science concepts. The student knows that interdependence and interactions occur within an ecosystem. The student is expected to:

(D) Identify and illustrate that long-term survival of species is dependent on a resource base that may be limited; and [Refer to slide 58, 63. Discuss how different species need resources to survive like the Austin Blind Salamander needs the spring water to survive. If resources deplete theses species' survival rate is very low.]

§112.44. Environmental Systems

(2) Scientific processes. The student uses scientific methods during field and laboratory investigations. The student is expected to:

(A) Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology; [Use slide 27 for a graphical approach of the formation and have the student formulate hypotheses on how water gets in the Edwards Aquifer. Using slide 26 to discuss how caves formed underground and how there exist underground drainages.]

(C) Organize, analyze, evaluate, make inferences, and predict trends from data; and [Use slides 50, 52, 66, 67. Have the students get into groups to analyze the graphs, and have them discuss to the class their groups findings. Have student predict future data from the present data and have them explain their predictions.]

(5) Science concepts. The student knows the interrelationships among the resources within the local environmental system. The student is expected to:

(B) Identify source, use, quality, and conservation of water; [What is a major source of water in central Texas? Explain what the Edwards aquifer is (Slide 3, 4). Who uses the Edwards aquifer's water (Slides 51-55)? As the population grows do we have enough water to satisfy everyone's wants and needs? Who needs the water more? Have a discussion about this question and have students make inferences on the topic.]

(D) Identify renewable and non-renewable resources that must come from outside an ecosystem such as food, water, lumber, and energy; [Is water a renewable or non-renewable resource? Have the students identify other resources the earth provides like water and if they are renewable or non-renewable. Have a discussion about this question and have students make inferences on the topic.]

§112.45. Chemistry

(2) Scientific processes. The student uses scientific methods during field and laboratory investigations. The student is expected to:

(A) Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology; [Use slide 27 for a graphical approach of the formation and have the student formulate hypotheses on how water gets in the Edwards Aquifer. Using slide 26 to discuss how caves formed underground and how there exist underground drainages.]

(12) Science concepts. The student knows the factors that influence the solubility of solutes in a solvent. The student is expected to:

(C) Evaluate the significance of water as a solvent in living organisms and in the environment. [Refer to slide 26. Discuss how water is the key to development of underground drainage systems along with some chemicals.
Refer to: http://esa.www5.50megs.com/geopro/karst/karst.html]

§112.46. Aquatic Science

(2) Scientific processes. The student uses scientific methods during field and laboratory investigations. The student is expected to:

(A) Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology; [Use slide 27 for a graphical approach of the formation and have the student formulate hypotheses on how water gets in the Edwards Aquifer. Using slide 26 to discuss how caves formed underground and how there exist underground drainages.]

(6) Science concepts. The student knows the roles of cycles in an aquatic environment.

The student is expected to:

(A) Identify the role of various cycles such as carbon, nitrogen, water, and nutrients in an aquatic environment [Refer to slide 26. Discuss how water is the key to the development of underground drainage systems along with a few chemicals. When water mixes with these chemicals it dissolves the ground, forms drainages, and it cycles over and over again.
Refer to: http://esa.www5.50megs.com/geopro/karst/karst.html]

(10) Science concepts. The student knows the origin and use of water in a watershed. The student is expected to:

(A) Identify sources and determine the amounts of water in a watershed including groundwater and surface water; [Refer to slide 50 for data on recharge, spring flow, and pumpage.]

(B) Research and identify the types of uses and volumes of water used in a watershed; and [Refer to slide 50 for data on recharge, spring flow, and pumpage. Refer to slides 51-55 for the Edwards Aquifer's uses.]

§112.49. Geology, Meteorology, and Oceanography

(8) Science concepts. The student knows the processes and end products of weathering. The student is expected to:

(A) Distinguish chemical from mechanical weathering and identify the role of weathering agents such as wind, water, and gravity; [Refer to slide 26. Discuss how water is the key to the development of underground drainage systems along with a few chemicals. When water mixes with these chemicals it dissolves the ground, forms drainages, and it cycles over and over again.
Refer to: http://esa.www5.50megs.com/geopro/karst/karst.html]

(B) Identify geologic formations that result from differing weathering processes; and [Refer to slides 18-23 for geologic formations influenced by different weathering processes. Discuss how different processes result in different formations.]

(10) Science concepts. The student knows the interactions that occur in a watershed. The student is expected to:

(A) Identify the characteristics of a local watershed such as average annual rainfall, run-off patterns, aquifers, locations of river basins, and surface water reservoirs; [Refer to slide 50 for data on recharge, spring flow, and pumpage.]

(C) Describe the importance and sources of surface and subsurface water. [Refer to slide 50 for recharge, spring flow, and pumpage. Where does the recharge water come from? Surface water? Subsurface water?]