

**Environmental Science Institute
The University of Texas at Austin**

**The Good, the Bad, and the Ugly: Texas'
Amazing Insects
by Dr. John C. Abbott**

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

Elementary TEKS

§112.2. Science, Kindergarten.

(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
- (D) Construct reasonable explanations using information
- (E) Communicate findings about simple investigations.

Have students think of what kinds of bugs they have seen. Have the class discuss what their favorite insects are and have them give evidence for their answer. Have the class use the presentation for evidence.

(3) Scientific processes. The student knows that information and critical thinking are used in making decisions. The student is expected to:

- (A) Make decisions using information
- (B) Discuss and justify the merits of decisions
- (C) Explain a problem in his/her own words and propose a solution.

Have the students think of an issue in the presentation (fire ant problem for example) and have them give opinions with evidence to whether or not they like the particular insect and what should be done with the insect to solve the problem.

(4) Scientific processes. The student uses age-appropriate tools and models to verify that organisms and objects and parts of organisms and objects can be observed, described, and measured. The student is expected to:

(A) Identify and use senses as tools of observation

(B) Make observations using tools including hand lenses, balances, cups, bowls, and computers.

Get some insects collected together that are dead and have students examine them using hand lenses Use slide 5 as reference for flies and slide 7 for bugs and 9 for dragonflies, etc.

(5) Science concepts. The student knows that organisms, objects, and events have properties and patterns. The student is expected to:

(A) Describe properties of objects and characteristics of organisms (Slide 18 gives a good example of an dragonfly eye)

(B) Observe and identify patterns including seasons, growth, and day and night and predict what happens next. (Larva to adult slides 11-13, 51)

(6) Science concepts. The student knows that systems have parts and are composed of organisms and objects. The student is expected to:

(A) sort organisms and objects into groups according to their parts and describe how the groups are formed (Slides 4,5,8,9,18,26,37,38,44,45,50,51)

(C) record observations about parts of animals including wings, feet, heads, and tails (Slides 4,5,8,9,18,26,37,38,44,45,50,51)

(7) Science concepts. The student knows that many types of change occur. The student is expected to:

(D) Observe and record stages in the life cycle of organisms in their natural environment. (Refer to the whole presentation with focus on the flies and dragonflies)

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

(A) Identify basic needs of living organisms (Slides 5, 7, 14-15, 19, 20, 27-36, 41, 51-53)

(B) Give examples of how living organisms depend on each other (Slide 4, 35, and 36)

§112.3. Science, Grade 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

(C) Gather information using simple equipment and tools to extend the senses

(D) Construct reasonable explanations and draw conclusions

(E) Communicate explanations about investigations.

Students should discuss and write out a question they have about an insect, research and give a good answer to their question with evidence.

(3) Scientific processes. The student knows that information and critical thinking are used in making decisions. The student is expected to:

(A) Make decisions using information

(B) Discuss and justify the merits of decisions

(C) Explain a problem in his/her own words and identify a task and solution related to the problem.

Students should find a problem with an insect, and address what can be done to fix the problem with the insect.

(4) Scientific processes. The student uses age-appropriate tools and models to verify that organisms and objects and parts of organisms and objects can be observed, described, and measured. The student is expected to:

(A) Collect information using tools including hand lenses, clocks, computers, thermometers, and balances;

(B) Record and compare collected information

(C) Measure organisms and objects and parts of organisms and objects, using non-standard units such as paper clips, hands, and pencils.

Students should examine dead insects and look at their parts and try to see how much they weigh and what size they are.

(5) Science concepts. The student knows that organisms, objects, and events have properties and patterns. The student is expected to:

(A) sort objects and events based on properties and patterns
(Slides 4,5,8,9,18,26,37,38,44,45,50,51)

(6) Science concepts. The student knows that systems have parts and are composed of organisms and objects. The student is expected to:

(A) sort organisms and objects according to their parts and characteristics (Slides 4,5,8,9,18,26,37,38,44,45,50,51)

(B) observe and describe the parts of plants and animals (Slides 4,5,8,9,18,26,37,38,44,45,50,51)

(7) Science concepts. The student knows that many types of change occur. The student is expected to:

(D) Observe and record changes in the life cycle of organisms.
(Slides 3, 4, 9-12, 26, 42, 45)

(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. Have students compare and contrast how insects eat and capture their food.

(B) Compare and give examples of the ways living organisms depend on each other for their basic needs. (Slides 4, 35, 36)

§112.4. Science, Grade 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;

(D) Gather information using simple equipment and tools to extend the senses;

(F) Communicate explanations about investigations.

Students should discuss and write out a question they have about an insect, research and give a good answer to their question with evidence.

(3) Scientific processes. The student knows that information and critical thinking are used in making decisions. The student is expected to:

(A) Make decisions using information;

(B) Discuss and justify the merits of decisions

(C) Explain a problem in his/her own words and identify a task and solution related to the problem.

Have students investigate into a topic from the presentation, it could be a problem or an issue and have them discuss in a group what they find and explain it with proof.

(5) Science concepts. The student knows that organisms, objects, and events have properties and patterns. The student is expected to:

(A) Classify and sequence organisms, objects, and events based on properties and patterns

Have students try to classify all the insects into groups based on different traits like color or body.

(6) Science concepts. The student knows that systems have parts and are composed of organisms and objects. The student is expected to:

(D) Observe and record the functions of animal parts. (Slides 4,5,8,9,18,26,37,38,44,45,50,51)

(8) Science concepts. The student distinguishes between living organisms and nonliving objects. The student is expected to:

(A) identify characteristics of living organisms(Slides 4,5,8,9,18,26,37,38,44,45,50,51)

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

(A) Identify the external characteristics of different kinds of plants and animals that allow their needs to be met (Slides 26-34)

(B) Compare and give examples of the ways living organisms depend on each other and on their environments. (Slides 4, 35, 36)

§112.5. Science, Grade 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;

(B) Collect information by observing and measuring;

(C) Analyze and interpret information to construct reasonable explanations from direct and indirect evidence

(D) Communicate valid conclusions

Students can conduct a research to find out what an insect does, how it eats and how it mates and what problem is surrounding the insect and what to do about it.

(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

Have students research and do a project about a particular insect that they like or have interest in and describe the habits of the insect.

(D) Describe how living organisms modify their physical environment to meet their needs such as beavers building a dam or humans building a home. (Slides 31-34, 51-52)

(9) Science concepts. The student knows that species have different adaptations that help them survive and reproduce in their environment. The student is expected to:

(A) Observe and identify characteristics among species that allow each to survive and reproduce. (Slides 21-25, 42, 49)

(B) Analyze how adaptive characteristics help individuals within a species to survive and reproduce. (Slides 21-25, 42, 49)

§112.6. Science, Grade 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;

(B) Collect information by observing and measuring;

(C) Analyze and interpret information to construct reasonable explanations from direct and indirect evidence;

(D) Communicate valid conclusions

Students can conduct a research to find out what an insect does, how it eats and how it mates and what problem is surrounding the insect and what to do about it.

(4) Scientific processes. The student knows how to use a variety of tools and methods to conduct science inquiry. The student is expected to:

(A) collect and analyze information using tools including calculators, safety goggles, microscopes, cameras, sound recorders, computers, hand lenses, rulers, thermometers, meter sticks, timing devices, balances, and compasses

Have students examine insects using tools to look at their body structure and their wings (if they have them)

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

(A) Identify characteristics that allow members within a species to survive and reproduce (Slides 21-25, 42, 49)

(B) Compare adaptive characteristics of various species (Slides 21-25, 42, 49)

§112.7. Science, Grade 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;
- (B) Collect information by observing and measuring;
- (C) Analyze and interpret information to construct reasonable explanations from direct and indirect evidence;
- (D) Communicate valid conclusions

Have students investigate a topic from the presentation and narrow it down to a good hypothesis. Then they can collect data on the topic and give evidence to support it or refute it.

(6) Science concepts. The student knows that some change occurs in cycles. The student is expected to:

- (C) Describe and compare life cycles of plants and animals.

Have students research about how some of the insects go through larva stages but some insects do not go through the larva stage.

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

- (A) Compare the adaptive characteristics of species that improve their ability to survive and reproduce in an ecosystem (Slides 21-25, 42, 49)
- (B) Analyze and describe adaptive characteristics that result in an organism's unique niche in an ecosystem (Slides 26-45)
- (C) Predict some adaptive characteristics required for survival and reproduction by an organism in an ecosystem. (Slides 21-25, 42, 49)

Middle School TEKS

§112.22. Science, Grade 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;
- (B) Collect data by observing and measuring;
- (C) Analyze and interpret information to construct reasonable explanations from direct and indirect evidence;
- (D) Communicate valid conclusions

Students could investigate their favorite insect from the presentation and form a hypothesis about what it does or could do and collect information on it, observe it and form explanations to see if their hypothesis is correct.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

- (A) Analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information

Students can look over the presentation and give their critique by writing a small paper and provide proof for their statements.

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

- (B) Describe how the properties of a system are different from the properties of its parts. (Slides 4,5,8,9,18,26,37,38,44,45,50,51)

(8) Science concepts. The student knows that complex interactions occur between matter and energy. The student is expected to:

- (C) Describe energy flow in living systems including food chains and food webs.

Have students discuss about the dung beetle and how dragonflies eat fish

(10) Science concepts. The student knows the relationship between structure and function in living systems. The student is expected to:

- (A) Differentiate between structure and function
- (C) Identify how structure complements function at different levels of organization including organs, organ systems, organisms, and populations.

Students could dissect an insect and look at the structure and then try to see how the parts function.

§112.23. Science, Grade 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;
- (B) Collect data by observing and measuring
- (C) Organize analyzes, make inferences, and predict trends from direct and indirect evidence;
- (D) Communicate valid conclusions

Students can form a hypothesis and make a project to present to the class about effects of insects on the ecosystem if there is nothing to keep that insects population in control. Students should gather data and research the effects when a species does not have a control and make educated predictions to what could happen when a component is removed.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

- (A) Analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information;

Students can write a critique for the presentation by pretending they are a journalist for a popular science magazine or paper. Evidence is needed to back up their argument and an explanation for their critique.

(4) Scientific processes. The student knows how to use tools and methods to conduct science inquiry. The student is expected to:

- (A) collect, analyze, and record information to explain a phenomenon using tools including beakers, petri dishes, meter sticks, graduated cylinders, weather instruments, hot plates, dissecting equipment, test tubes, safety goggles, spring scales, balances, microscopes, telescopes, thermometers, calculators, field equipment, computers, computer probes, timing devices, magnets, and compasses

Students can dissect insect using tools and try to explain why an insect has a particular ability or trait.

(5) Science concepts. The student knows that equilibrium of a system may change. The student is expected to:

(B) Observe and describe the role of ecological succession in maintaining equilibrium in an ecosystem. (Slides 43-49)

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

(B) Observe and describe how organisms including producers, consumers, and decomposers live together in an environment and use existing resources (Slides 3, 4, 5, 9-15, 26-37)

(C) Describe how different environments support different varieties of organisms.

Examine the whole presentation and look at how each insect interacts with its environment and what happens when insects get put into their wrong environment.

§112.24. Science, Grade 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;

(B) Collect data by observing and measuring;

(C) Organize analyzes, evaluate, make inferences, and predict trends from direct and indirect evidence;

(D) Communicate valid conclusions

Students can write a paper or do a project on a particular insect and how it affects the ecosystem around it. What would happen if it was removed or relocated? What are humans doing or could do to affect it? Students should have a clear hypothesis, collect data and give clear conclusions in an organized manner.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(A) Analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information

Students should critique the presentation and compare the facts given on one insect to another resource and see what facts overlap or contradict; good evidence with references should be given for this.

(4) Scientific processes. The student knows how to use a variety of tools and methods to conduct science inquiry. The student is expected to:

(A) collect, record, and analyze information using tools including beakers, petri dishes, meter sticks, graduated cylinders, weather instruments, hot plates, dissecting equipment, test tubes, safety goggles, spring scales, balances, microscopes, telescopes, thermometers, calculators, field equipment, computers, computer probes, water test kits, and timing devices; and

(B) Extrapolate from collected information to make predictions.

Students should dissect an insect, look at the parts of the insect and predict how it evolved or how it works, for example, look at the wings of the dragonfly and try to give educated responses through research of how it got it and how it works, and a prediction if the environment changed. What would happen to it, how and what it adapt to?

(6) Science concepts. The student knows that interdependence occurs among living systems. The student is expected to:

(C) Describe interactions within ecosystems.

Examine how each insect interacts with each and how each insect eats, what it eats and what it does when there is a change in the ecosystem like the introduction of a foreign insect or animal.

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

(B) Analyze how natural or human events may have contributed to the extinction of some species (Slides 8, 43-49)

High School TEKS

§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;

(B) Collect data and make measurements with precision

(C) Organize, analyze, evaluate, make inferences, and predict trends from data; and

(D) Communicate valid conclusions.

Students can form a hypothesis from material given in the presentation and write a report on a specific topic about an insect with evidence and details covering everything from where the insect lives, its body parts and functions and how it reproduces and eats.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(A) Analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information

Hold a debate or have the students write a short paper on a topic from the lecture. Do they think it was accurate enough, was enough information given? What information should be included and what is the information? Students review and give their analysis and show what should be changed/not changed.

(5) Science concepts. The student knows how an organism grows and how specialized cells, tissues, and organs develop. The student is expected to:

(C) Sequence the levels of organization in multicellular organisms to relate the parts to each other and to the whole.

Have students examine a particular insect and what each body part does. Examine the insects under microscopes to see details.

(7) Science concepts. The student knows the theory of biological evolution. The student is expected to:

(B) Illustrate the results of natural selection in speciation, diversity, phylogeny, adaptation, behavior, and extinction.

Have students investigate into why some insects are called “living fossils”.

(8) Science concepts. The student knows applications of taxonomy and can identify its limitations. The student is expected to:

(A) Collect and classify organisms at several taxonomic levels such as species, phylum, and kingdom using dichotomous keys

(B) Analyze relationships among organisms and develop a model of a hierarchical classification system based on similarities and differences using taxonomic nomenclature

Have students classify the insects shown in the presentation. Are all the animals insects?

(9) Science concepts. The student knows metabolic processes and energy transfers that occur in living organisms. The student is expected to:

(D) Analyze the flow of matter and energy through different trophic levels and between organisms and the physical environment.

Students should examine how insects play in the flow of energy. What role do dung beetles play? What about dragonflies or butterflies?

(10) Science concepts. The student knows that, at all levels of nature, living systems are found within other living systems, each with its own boundary and limits. The student is expected to:

(A) Interpret the functions of systems in organisms including circulatory, digestive, nervous, endocrine, reproductive, integumentary, skeletal, respiratory, muscular, excretory, and immune

(B) Compare the interrelationships of organ systems to each other and to the body as a whole

Have students dissect an insect and look at how the insect parts are similar and different from humans and mammals.

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

(B) Interpret interactions among organisms exhibiting predation, parasitism, commensalism, and mutualism (Slides 4,5,7,movie,14,15,19,35,26,49,52,53)

(C) Compare variations, tolerances, and adaptations of plants and animals in different biomes. (Slide 49)

(E) Investigate and explain the interactions in an ecosystem including food chains, food webs, and food pyramids. (Slides 3, 4, 5, 9, 12-15, movie, 19, 26 and 41)

§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;

(B) Collect data and make measurements with precision;

(C) Organize, analyze, evaluate, make inferences, and predict trends from data; and

(D) Communicate valid conclusions.

Have students conduct a research project on the effects of the environment when other foreign insects are introduced. What have the fire ants done so far? What could they do? Are human activities killing off butterflies, could our street lights be misguiding them or killing them? How may that effect the environment?

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(A) Analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information

Have the students conduct a debate with supporting evidence against an idea or statement they disagree with in the presentation. Do some think fire ants are under control? Students should conduct investigations in the field too and observe the insect to gather data.

(4) Science concepts. The student knows the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes. The student is expected to:

(A) Identify indigenous plants and animals, assess their role within an ecosystem, and compare them to plants and animals in other ecosystems and biomes.

Examine how local insects interact with foreign insects

(D) Predict how the introduction, removal, or reintroduction of an organism may alter the food chain and affect existing populations.

Examine the issue of fire ants from South America

(E) Predict changes that may occur in an ecosystem if biodiversity is increased or reduced.

Have students predict what would happen to the ecosystem if another insect or animal was brought in from afar to control one insect population. (Slides 44, 45, 49)

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

(E) Analyze and evaluate the economic significance and interdependence of components of the environmental system
(Slides 4, 29, 45, 47-49, 51)

(6) Science concepts. The student knows the sources and flow of energy through an environmental system. The student is expected to:

(B) Explain the flow of energy in an ecosystem;

(C) Investigate and explain the effects of energy transformations within an ecosystem

(D) Investigate and identify energy interactions in an ecosystem.

Have students examine how energy flows through insects in Texas. What level are dung beetles or dragonflies? Have students explain their investigations in the form of a small essay possibly.

(7) Science concepts. The student knows the relationship between carrying capacity and changes in populations and ecosystems. The student is expected to:

- (A) Relate carrying capacity to population dynamics (Slides 43-49)
- (B) Calculate exponential growth of populations (Slides 43-49)
- (D) Analyze and make predictions about the impact on populations of geographic locales, natural events, diseases, and birth and death rates. (Slides 43-49)

Have students do a project on predicting the growth of the fire ant population in North America and what could happen if people introduce another organism to control the fire ant population. Could the organism also get out of control?

(8) Science concepts. The student knows that environments change. The student is expected to:

- (A) Analyze and describe the effects on environments of events such as fires, hurricanes, deforestation, mining, population growth, and municipal development (Slide 47)
- (B) Explain how regional changes in the environment may have a global effect (Slides 4, 48 and 49)
- (C) Describe how communities have restored an ecosystem (Slides 46, 49)
- (D) Examine and describe a habitat restoration or protection program. (Slide 49)

Have students research how fire ants affect people. Could fire ants pose to be a world wide problem or are they already are a world issue? How could disasters help the fire ants spread? What are people doing daily and what are the community programs in your area doing that can affect the insect population?

§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;
- (B) Collect data and make measurements with precision;

(C) Express and manipulate quantities using mathematical procedures such as dimensional analysis, scientific notation, and significant figures;

(D) Organize, analyze, evaluate, make inferences, and predict trends from data; and

(E) Communicate valid conclusions.

Have students do a presentation on the relation between an aquatic system and insects. Can insects cause major effects on other populations if left unchecked? What would happen if new species of insects were introduced into an aquatic environment? What would be the effects and why? Slides 8-15 good for reference

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(A) Analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information (Slides: 8-15, 23, 25)

Have students evaluate the presentation. Did they think the facts about insects in water was weak or strong and why?

(5) Science concepts. The student knows the relationships within and among the aquatic habitats and ecosystems in an aquatic environment. The student is expected to:

(A) Observe and compile data over a period of time from an established aquatic habitat documenting seasonal changes and the behavior of organisms;

(B) Observe and evaluate patterns and interrelationships among producers, consumers, and decomposers in an aquatic ecosystem;

(C) Identify the interdependence of organisms in an aquatic environment such as a pond, river, lake, ocean, or aquifer, and the biosphere

(D) Evaluate trends in data to determine the factors that impact aquatic ecosystems.

Students could do projects on how insects live in aquatic systems and how they behave in the food chain in an aquatic system. Do insects live in aquatic environments mostly? Is an aquatic environment important to their reproduction

and larvae? These are some questions that could be suggested for the student to answer.

(7) Science concepts. The student knows environmental adaptations of aquatic organisms. The student is expected to:

(B) Compare and describe how adaptations allow an organism to exist within an aquatic environment

Students can research about how insects fly around, “stand on” and swim in water. What features allow them to do that? Why do insects stay around water? How could have dragonflies evolved to eating small fish?