

Dear Educators,

The 2010 Texas Essential Knowledge and Skills (TEKS) for science include new laboratory and field requirements. Outdoor investigations are specified in the elementary TEKS.

The Texas Environmental Education Advisory Committee (TEEAC) cooperates with a number of zoos, museums, and nature centers that are designated as TEEAC Providers. TEEAC Providers offer workshops for teachers based upon the TEKS and send representatives to an annual workshop on changes to the TEKS and to statewide assessments, the End-of-Course (EOCs) examinations and the Texas Assessment of Knowledge and Skills (TAKS).

Are there any new laboratory and field requirements in the 2010 science TEKS?

Yes. In the new Texas Essential Knowledge and Skills (TEKS) for science, laboratory and field investigations will take on increased importance. First, the 40% time requirement has been expanded from the high school level to the middle school level. Second, science equipment and supplies are now specified at the high school level, expanding on the K-8 requirements. Third, the elementary-level science TEKS now have recommendations for time percentages.

- How much laboratory and field time is suggested for elementary school science programs?

In grades K-1, districts are encouraged to facilitate classroom and outdoor investigations for at least 80% of instructional time.

In grades 2-3, districts are encouraged to facilitate classroom and outdoor investigations for at least 60% of instructional time.

In grades 4-5, districts are encouraged to facilitate classroom and outdoor investigations for at least 50% of instructional time.

- How much laboratory and field time is required for middle school science programs?

In grades 6-8, students for at least 40% of instructional time, conduct laboratory and field investigations.

- How much laboratory and field time is required for high school science programs?

For all courses that receive science credit in grades 9-12, students for at least 40% of instructional time, conduct laboratory and field investigations.

All of the science TEKS are found in 19 Texas Administrative Code (TAC), Chapter 112. These documents are available at <http://ritter.tea.state.tx.us/rules/tac/chapter112/index.html>.

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The Texas Environmental Education Advisory Committee

The Texas Environmental Education Advisory Committee (TEEAC) coordinates with other state, regional and local agencies that are charged with the development of environmental education materials. The network of providers of environmental education professional development includes universities, state agencies, museums and nature centers and helps assure that teacher professional development offered by formal and non-formal providers is educationally sound and consistent with the Texas Essential Knowledge and Skills (TEKS).

To receive a TEEAC Certificate of Recognition, teachers and other educators take approved workshops offered by TEEAC providers. At the completion of the workshop, they receive stickers, that are placed on a Coursework Verification Form. When 45 hours of professional development are completed and documented by the accumulated stickers, the Coursework Verification Form is mailed to the Texas Education Agency (TEA). A current list of TEEAC Providers is found below. Please contact the site directly for upcoming workshop information.

TEEAC Providers may apply for workshop approval by completing a Program Description Form. Send the completed form to Irene Pickhardt, Texas Education Agency, 1701 N. Congress Ave., Austin, Texas 78701 or e-mail Irene.Pickhardt@tea.state.tx.us.

TEEAC Providers (as of November 7, 2009)

Austin Nature and Science Center

The Austin Nature and Science Center provides educational and recreational opportunities to increase awareness of and appreciation for the natural environment. Professional development for teachers is offered as teacher workshops at ANSC and teacher workshops arranged in partnership with area school districts. Contact: Janice Sturrock, 512-327-8181, extension 13, <http://www.ci.austin.tx.us/ansc/>.

Camp JOLT

Take a journey on Lake Texoma with the JOLT staff of All Saints Camp and Conference Center. Highly qualified instructors will guide students through an exciting array of hands-on environmental science, adventure, and team building activities! Contact: 903-786-3148, <http://www.jolt-texoma.org/>.

Coastal Bend Bays & Estuaries Program

Learning on the Edge Teacher Academy provides educators added insight into the issues affecting the bays and estuaries, a sound knowledge base of the local ecology, and supplies and curriculum that translates into successful science experiences for their students. Contact: 361-885-6207, <http://www.cbbep.org/>.

Collin County Adventure Camp

Enjoy overnight and daytime outdoor education on the Blackland Prairie for students, and teacher workshops in outdoor ecology, Project WILD, GLOBE, customized teacher retreats. Contact: 469-952-5600, <http://www.collincountyadventurecamp.org/index.cfm?FuseAction=Page&PageID=1002695>.

Dallas ISD Environmental Education Center

The Dallas Environmental Education Center uses the museum resources and 500 acres of north Texas habitat to provide quality educational programs and staff development opportunities for Dallas area teachers and students. Contact: 972-749-6900, <http://www.dallasisd.org/depts/eec/eec.html>.

EarthKeepers® Children's Education at Texas Discovery Gardens

The education department at Texas Discovery Gardens is committed to providing quality, outdoor, and year-round educational opportunities for Dallas area teachers and students. Contact: 214-428-7476, extension 270, http://www.texasdiscoverygardens.org/environmental_education.shtml

Edwards Aquifer Research and Data Center/Aquatic Sciences Adventure Camp

The program involves week-long and two-day summer camps for students (ages 9-15) where teachers emphasize aquatic biology and water chemistry. Contact: 512-245-3541, <http://www.eardc.txstate.edu/>.

Environmental Institute of Houston Institutes Environmental Education (EE) Workshops

EIH offers a variety of EE workshops and institutes focusing on a wide array of environmental programs including school habitat development and implementation, WOW – the Wonders Of Wetlands, and Air-O-Dynamic. Contact: Wendy Reistle, 281-283-3045, <http://www.uhcl.edu/portal/page/portal/EIH/>.

Guadalupe-Blanco River Authority (GBRA)

GBRA offers a wide variety of water resource opportunities (both outdoor and classroom) for students and teachers in the Guadalupe River Basin. Contact: 830-379-5822, <http://www.gbra.org/education/>.

The Heard Natural Science Museum & Wildlife Sanctuary

The Heard is committed to providing quality, enjoyable environmental education opportunities for all educators. They offer a wide variety of professional development workshops that include Project WILD, Project WET, Project Learning Tree and Flying WILD. Contact: Schelly Corry, scorry@heardmuseum.org, or 972-562-5566, extension 227, <http://www.heard.org/education/index.html>.

Keep Austin Beautiful

Keep Austin Beautiful provides presentations, activity kits, tools, cleanup supplies, recycling bins, and more to promote environmental stewardship. Contact: Monica Lopez Magee, 512-391-0619, <http://www.KeepAustinBeautiful.org/educate>.

Kleb Woods Nature Park

The Harris County Cypress Top Historic Park and Kleb Woods Nature Preserve and Historic Farm offer a variety of workshops for teachers and learning experiences for students. Contact: Linda Martin-Rust, 281-357-5324, <http://www.pct3.hctx.net/parks/klebwoodsnaturepres.aspx>.

Lower Colorado River Authority-Matagorda Bay Nature Park

All programs support TEKS objectives and are designed to engage the learner and lead to thoughts/actions of land, water or energy stewardship and conservation. Contact: 800-776-5272, extension 4740, <http://www.lcra.org/parks/education.html>.

Lower Colorado River Authority-McKinney Roughts Nature Park

All programs support TEKS objectives and are designed to engage the learner and lead to thoughts/actions of land, water or energy stewardship and conservation. Contact: 800-776-5272, extension 8001, <http://www.lcra.org/parks/education.html>.

Major Rivers - Water Education for Texas

The program's host, Major Rivers (named for the major rivers of Texas) and his horse Aquifer are designed to help elementary school children learn about their state's major water resources, how water is treated and delivered to their homes and schools, and how to care for their water resources and use them wisely. Contact: 512-303-5073 or 800-776-5272, extension 8001, http://www.lcra.org/envedu/major_rivers.html.

Nature Discovery Center

Nature at Your Doorstep: Real World Investigations for Primary Students and educator workshops for Project WILD, Project Learning Tree, WET in the City; Aquatic WILD, and Nature Detectives provides hands-on science for preschool and kindergarten in a lush 4-acre park, the Center offers children's classes and camps, programs for elementary schools, birding walks and fieldtrips, adult lecture series, educator workshops for both national and Center programs. Contact: Jennifer Gillespie-Malone, 713-667-6550, http://www.lcra.org/envedu/major_rivers.html.

North Plains Groundwater Conservation District

North Plains Groundwater Conservation District is constantly striving to educate the public about our precious groundwater resources and the importance of protecting and conserving them. Hands-on one-day workshops, such as Project WET and Major Rivers, are offered to familiarize teachers with the water education materials, where teachers take home free curriculum guides and free materials kits for classrooms. Contact: Rhonda Artho, 806-935-6401, <http://www.npwd.org/>.

Our Lady of the Lake University GLOBE Partnership

K-12 teachers learn how to help their students gather and analyze environmental data on their campus and then send it into an international data base that scientists use. Contact: 210-434-6711, extension 8215, <http://www.globe.gov/>.

Project E³- Expanding Energy Education Workshops

Project E³ workshops provide cross-curricular hands-on activities related to hydrocarbon based energy themes which are correlated to state and national standards. Contact: Doris Tomas, 281-544-2435, <http://www.oceanstaroec.com/>.

Project WILD, a Texas Parks and Wildlife Department Program

Project WILD is a supplementary, interdisciplinary environmental education resource. Activity guides are distributed through active workshops. Texas-specific local and regional issues and resources customize this nationally distributed and recognized program. Contact: Kiki Corry, 512-389-4369, http://www.tpwd.state.tx.us/learning/project_wild/.

Schoolyard Habitats- A Place for Learning

The National Wildlife Federation provides community workshops, professional development for teachers, and educational resources for area school districts and informal educational settings that promote the use of schoolyard habitats as a cross-curricular learning environment. The program is supported by the Access Nature curriculum that supports TEKS objectives. Other educational programs and resources, including Eco-Schools, Climate Classroom and Green Hour are available. Contact Andrea Dravigne, dravigne@nwf.org or 512-610-7768, <http://www.nwf.org/>.

Sea Camp

Sea Camp – Texas A&M University at Galveston offers marine biology learning experiences for students and TEEAC credit for teachers who participate in programs.

Contact: Daisy Duerson, 409-740-4525, <http://www.tamug.edu/seacamp/>.

Service-Learning—Texas

A statewide initiative of TEA and Region 14 Education Service Center seeks to make service-learning -- the integration of student-designed service projects with classroom learning -- a common experience for all Texas students. Contact: 512-420-0214, <http://www.txcs.org/>.

Sibley Nature Center

The Sibley Nature Center offers workshops for teachers and students and boasts the best bioregional education website on the internet with over 4000 photos of West Texas in 110 photoessays and 600+ essays about Llano Estacado ecology and history. Contact: Burr Williams at 432-684-6827, <http://www.sibleynaturecenter.org/>.

South Central Microscale Chemistry Center

The Microscale Chemistry Center's major focus is offering workshops and professional development on the operation and advantages of converting laboratories to the microscale level while promoting hands-on science and engaged learners.

Contact: 903-510-2528, <http://chemistry.tjc.edu/scrmcc.htm>.

Texas Environthon

The Environmental Institute of Houston offers an environmental competition for high school students (grades 9 – 12) focusing on soils, forestry, aquatics, wildlife and a current environmental issue that changes each year. Contact: Wendy Reistle, 281-283-3045, <http://www.texasenvirothon.org/>.

Texas Forestry Association – Project Learning Tree

Project Learning Tree® (PLT) is an award winning, multi-disciplinary environmental education program for educators and students in PreK-grade 12. Contact: Casey Harris, 936-632-8733, <http://www.plttexas.org/>.

Texas Nature Trackers, a Texas Parks and Wildlife Department Program

Texas Nature Trackers is a citizen science monitoring effort designed to gather scientific data on species of concern in Texas through experiential learning. Participants may participate in four-seven-hour Texas Amphibian and Mussel Watch Workshops scheduled throughout the state.

Contact: Marsha May, 512-389-8062, http://www.tpwd.state.tx.us/learning/texas_nature_trackers/.

Texas Regional Collaboratives (TRC) at The University of Texas at Austin

The TRC has 36 science regional collaborative that provide professional development opportunities in Project WILD, Project Learning Tree (PLT), and GLOBE. Contact: Marsha Willis, Professional Development Coordinator/GLOBE State Coordinator at marshawillis@mail.utexas.edu, <http://thetrc.org/trc/>.

Texas State Aquarium

Experience a variety of professional development opportunities such as Project WILD, Project WILD Aquatic, Project WET, Project Learning Tree, Energy and Society, Flying WILD, and Project WET. Contact: Auburn Carpenter, 361-881-1203,

http://www.texasstateaquarium.org/index.php?option=com_content&view=article&id=23&Itemid=43.

Texas Stream Team

Texas Stream Team trains volunteers, including teachers and students, to collect water quality data on lakes, rivers, streams, wetlands, bays, bayous, and estuaries in Texas.

Contact: 877-506-1401, <http://txstreamteam.rivers.txstate.edu/#>.

Texas Water Development Board - TWDB Kids

The Texas Water Development Board (TWDB) offers K-12 educational resources for students and professional development workshops for educators on the topic of Texas water resources and water conservation. Contact: Linda Ruiz McCall, 512-463-5836, <http://www.twdb.state.tx.us/kids/>.

Texas Wildlife Association

Texas Wildlife Association believes that today's children are tomorrow's decision makers and have thus made it their mission to create an awareness of wildlife and wildlife related issues by implementing new and innovative programs that enable educators to meet their goals while fostering a consciousness of the natural world. Contact: 210-826-2904,

<http://www.texas-wildlife.org/>.

Treetops-in-the-Forest

Treetops-in-the Forest is a residential program combining TEKS-related math and science content with actual daily environmental responsibilities involving grounds and gardens, food preparation, systems and community insights and interaction. Arts and humanity resources are used to reinforce environmental awareness. Contact: 936-655-2557 or 972-262-2816, <http://www.treetopsintheforest.org/>.

UT MD Anderson Cancer Center Environmental Health Sciences Summer Institute

The summer institute offers an extensive variety of workshops pursuing the connections between health and the environment. Learn how to help students use scientific inquiry to develop an understanding of the mechanisms that affect the environment and our health.

Contact: Heather Reddick, 512-237-6407, <http://k12summerinstitute.mdanderson.org/home/>.

University of Texas at San Antonio (UTSA)

UTSA, an official GLOBE partner, offers a variety of professional development opportunities through workshops and college courses for preservice and inservice teachers. Contact: Dr. Christine Moseley, 210-458-5992,

http://ilt.utsa.edu/Faculty_Pages/Christine_Moseley.htm.

A Model for Field Investigation

Note: Correlative is not included here because it is not listed in TEKS.

Two Types of Field Investigations		
Essential Questions	What defines my environment? What is a healthy environment? What is humans' relationship to the environment? How can our community sustain our environment? What is my role in the preservation and use of environmental resources?	
	Descriptive	Comparative
Formulate Investigative Question	How many? How frequently? When does happen during the year? (flowering, fruiting, babies born) What is the (temperature, speed, height, mass, density, force, distance, pH, etc)	Is there a difference between groups, conditions, times, or locations? Make a prediction or hypothesis about differences.
Identify Setting within a System	Identify geographic scale of investigation (e.g., riparian corridor or Cedar River Watershed) Identify time frame of the investigation (e.g., season, hour, day, month, year)	
Identify Variables of Interest	Choose measurable or observable variables	Choose a measured variable in at least two different (manipulated variable) locations, times, organisms, or populations
Collect and Organize Data	Multiple measurements over time or location in order to improve system representation (model) Individual measurement is repeated if necessary to improve data accuracy Record and organize data into table(s) or other forms	
		Describe how sampling, measurement, observations were consistent for the two or more locations, times or organisms (controlled variables) and was random and representative of the site.
Analyze Data	Means, medians, ranges, percentages, estimations calculated when appropriate Organize results in graphic and/or written forms and maps using statistics where appropriate	
	Typical representations of the data to build descriptive and comparative models Charts Line Plots Bar Graphs Maps	
Use Evidence to Support a Conclusion	Answer the investigative question Use data to support an explanation. What does the data mean? Limit conclusion to the specific study site. Compare data to standards.	
	Does the data summary answer the investigation question?	Does the evidence support the prediction or hypothesis ?
Discussion	<i>How does the data compare to other similar systems/models? What factors might have impacted my research? How do my findings inform the essential questions and/or understanding of the system? What are my new questions? What other data do I need? What action should be taken? Why?</i>	

Documenting the Field Investigation Process

Essential Question

Big picture questions that cannot be answered with one investigation.

Investigation Question

Researchable question that can be answered with qualitative or quantitative observations or measurements.

Hypothesis/Prediction

For comparative studies, predict what will happen to the responding (measured) variable when one of the changes occurs. Secondary students should also give a reason for their prediction.

Materials

List the materials needed to perform the investigation.

Procedure

- Logical steps to do the investigation; steps written clearly so someone else could follow procedure.
- What variables are under study? What is changed (*manipulated*)? What is measured (*responding*)?
- How, when, and/or where will observations/measurements be taken? How will samples or measurements be repeated?
- How is sampling/measurement method consistent (controlled variables) or systematic? Secondary students should describe how sampling is random and representative of the site.

Collecting, Organizing, and Analyzing Data

- **Observe /Record Data**—Data/observations/measurements are recorded systematically on a data collection sheet. Location, date, time of day and a description of study site (including weather) is recorded.
- **Organize Results**—Results are organized into categories in tables, charts, graphs, maps, and/or other written forms making appropriate calculations (e.g. total growth, distances, total number observed).
- **Analyze Data to Look for Patterns and Trends**—Populations are estimated; means, modes, or medians are calculated; graphs, tables, or maps are analyzed for patterns; data are compared to standards.

Conclusion

- Provide a clear conclusive statement that answers the investigation question or states whether the hypothesis or prediction was correct. For descriptive investigations, provide a detailed description or model of results.
- Restrict conclusions to the time and place the investigation took place.
- Compare data to standards when appropriate.
- Use data to support the conclusion, description, or model.
- Use explanatory language to connect supporting data to the conclusion, description, or model.

Discussion

- Identify factors in the field that may have affected the outcomes of the investigation.
- Describe how the procedures might have been more systematic.
- Describe any other reasons/observations that could explain results.
- Discuss how results inform the essential question and/or system understanding.
- Provide new questions about the system or model.
- Recommend future actions and explain why.

Excerpts from: Field Investigations: Using Outdoor Environments to Foster Student Learning of Scientific Processes

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<http://fishwildlife.org/pdfs/Field%20Investigation%20Guide.pdf>