

WE'VE GOT A PROBLEM



INTERDISCIPLINARY



HIGH SCHOOL

This guide links the *We've Got a Problem* unit to the Texas Essential Knowledge and Skills (TEKS) for high school students. *We've Got a Problem* is an interdisciplinary unit that allows students to explore solutions to a real problem on their campus or in their community. *We've Got a Problem* leads students to practice skills in all subject areas. For example, students may use graphs, tables, and statistical data, included in the Mathematics TEKS, to present an argument for a change. They will use the writing and research skills of the English Language Arts and Reading and Social Studies TEKS. The following document includes the applicable TEKS and the details of the *We've Got a Problem* unit. The asterisks indicate the TEKS which are testable on the State of Texas Assessments of Academic Readiness (STAAR). The final section of this document presents the applicable Texas College and Career Readiness Standards adopted by the Texas Higher Education Coordinating Board (THECB) on January 24, 2008.

Description of Unit

This unit encourages students to set up a proposal for an actual collaborative project which they can pursue. Students begin by developing a pre-proposal, and identifying stakeholders and potential funding sources. Finally, students will develop a real proposal and actually try to make the project a reality.

Goals

Students will meet these goals in their explorations:

- Ask questions and explore theories
- Have opportunities to generate new ideas
- Develop the essential skills of logical thinking, creative problem solving, intellectual risk taking, and communicating
- Become familiar with the process of setting up a proposal, doing the research and acquiring funding for a project
- Establish a target audience for the proposal

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Phase I. Learning Experiences

The learning experiences model the proposal development process. The class will go through the process as individuals will do in the independent research phase of the task.

1. Develop a pre-proposal.
 - Identify a problem or issue that the class will investigate
 - Develop a rationale explaining why this study is necessary and important
 - Identify resources students will need to learn more about the subject (e.g., books, periodicals, experts, videos, surveys, experiments, computer programs, presentations, collections, museums)
 - Identify the research design students will use to collect data, the type of data to be collected, and the strengths and weaknesses of the design
 - Develop a realistic timeline
 - Identify all the stakeholders and the target audience with whom students will share the information

2. The class will do the research necessary to write a full proposal that will include strategies for solving the problem identified. They must build a strong case for why stakeholders should address the problem in the way the class has identified. This is a process that change agents must go through frequently to obtain the necessary resources for solving the problems that are important to them and to others in society.

3. Develop a proposal to take to a stakeholder group. The proposal should include:
 - A problem or issue
 - A proposed solution
 - A rationale explaining why the question is important and why the proposed solution will solve the problem
 - A statement of others' opinions about the problem or issue
 - A summary of research
 - Resources that will be needed to solve the problem, including a realistic timeline and budget
 - Résumés of those who will be working on the project

4. Present the proposal to the stakeholder group. Websites where potential funders or programs may be found include:
 - <http://web.mit.edu/inventteams/apply.html>
 - http://www.pcrd.purdue.edu/documents/grant_writing/potential_funding_sources.doc
 - <http://www.mdibl.org/edu/highschool.shtml>
 - <http://www.training.nih.gov/student/sip/index.asp>

5. A completed project includes:
 - a. Process record that includes documentation of individual growth during Phase I: Learning Experiences

- b. Pre-proposal
- c. Proposal
- d. Videotape of presentation

Phase II. Independent Research

Upon completion of Phase I: Learning Experiences, students will begin to prepare their actual proposals for change. Students may choose to respond in a variety of formats, such as charts, diagrams, graphic organizers, paragraphs, or a combination of these. Students may use all of the material they have gathered in the learning experiences and other classroom resources to answer the questions.

What have you learned about the change process? Why are some people resistant to change? What does it take to change the minds of resistant people?

A. Research process

1. Selecting a topic. Choose an area of need. Outline a plan for solving the problem.
2. Asking guiding questions. Once the student has selected a topic, he/she should think of three to five guiding questions to explore, such as:
 - Why is this issue important?
 - What changes would you like to see? Why?
 - How can these changes be implemented? Break down the process into detailed steps.

While these examples are general, the student's questions should be specific to the chosen topic. The questions should lead him/her to form individual research-based opinions. The student should develop a hypothesis or some possible answers to the questions.

3. Designing a research proposal. The student should include numerous components in the research proposal:
 - The issue he/she would like to study
 - Three to five guiding questions he/she will investigate and hypotheses
 - Primary and secondary resources he/she will need to find answers to questions
 - Strengths and weaknesses of current policies governing the issue
 - The five most important things to know
 - Appropriate decision-making bodies involved (at city, state, and national levels)
4. Conducting the research. After you have approved student proposals, students begin using the resources they have identified and others they may encounter. During this stage, students will need to keep a log, note cards, or resource process sheets of all the sources and what they learn from each one.
5. Drawing conclusions. Based on their research, each student should make a list of recommendations or solutions for their chosen issue.

B. The product

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Each student creates a proposal to present. The proposal should include reasons the issue is important, changes that need to be made, and how these changes could be implemented. The presentation should be similar to what would be given to a stakeholder group.

C. Communication

Each student presents their proposal to the class. Time should be allotted for the audience to ask questions. The Q&A session should be impromptu and unscripted in order to accurately reflect student learning.

Students will then contact the potential funders and begin to promote their proposals. Depending on the success of their contacts, the project can be taken as far as the student would like to take it.

D. A completed project consists of:

1. The research proposal, including guiding questions
2. A research log, note cards, or resource process sheets
3. The product
4. A Works Cited Page
5. A videotape or audiotape of the presentation to the class, including the unscripted Q&A session

Resources for writing formal grant proposals:

<http://www.arc.gov/index.do?nodeId=102>

<http://www.montclair.edu/ORSP/preaward/NSF/NSF%20Successful%20Proposal.pdf>

<http://www.research.buffalo.edu/sps/about/guide/chapter4.cfm>

http://www.mygovernmentgrants.com/grant_proposal.htm

Texas Essential Knowledge and Skills

The unit may address the following TEKS:

Mathematics:*

Mathematical Models with Applications

- | | |
|------|--|
| M.1 | Uses mathematical processes to acquire and demonstrate mathematical understanding |
| M.8 | Applies mathematical processes to determine the number of elements in a finite sample space and compute the probability of an event |
| M.9 | Applies mathematical processes and mathematical models to analyze data as it applies to social sciences |
| M.10 | Applies mathematical processes to design a study and use graphical, numerical, and analytical techniques to communicate the results of the study |

*More Mathematics TEKS could apply, depending on the student's topic of investigation.

Science:***Integrated Physics and Chemistry***

- C.2 Uses scientific methods during laboratory and field investigations* (Testable on the Chemistry STAAR)
- C.3. Uses critical thinking, scientific reasoning, and problem solving to make informed decisions* (Testable on the Chemistry STAAR and Physics STAAR)

* More Science TEKS could apply, depending on the student's scientific investigation.

Social Studies:***United States History***

- US.27 Understands the impact of science, technology, and the free enterprise system on the economic development of the United States* (Testable on the U.S. History STAAR, Reporting Category 4)
- US.28 Understands the influence of scientific discoveries, technological innovations, and the free enterprise system on the standard of living in the United States* (Testable on the U.S. History STAAR, Reporting Category 4)
- US.29 Applies critical-thinking skills to organize and use information acquired from a variety of valid sources, including electronic technology* (Testable on the U.S. History STAAR)

English Language Arts and Reading:***English I***

- I.1 Understands new vocabulary and uses it when reading and writing* (Testable on the English I STAAR, Reporting Category 1)
- I.2 Analyzes, makes inferences, and draws conclusions about theme and genre in different cultural, historical, and contemporary contexts and provides evidence from the text to support their understanding* (Testable on the English I STAAR, Reporting Category 1, Reporting Category 2)
- I.8 Analyzes, makes inferences, and draws conclusions about the author's purpose in cultural, historical, and contemporary contexts and provides evidence from the text to support their understanding* (Testable on the English I STAAR, Reporting Category 3)
- I.11 Understands how to glean and uses information in procedural texts and documents* (Testable on the English I STAAR, Reporting Category 3)
- I.12 Uses comprehension skills to analyze how words, images, graphics, and sounds work together in various forms to impact meaning* (Testable on the English I STAAR, Reporting Category 2, Reporting Category 3)
- I.13 Uses elements of the writing process (planning, drafting, revising, editing, and publishing) to compose text* (Testable on the English I STAAR, Reporting Category 4, Reporting Category 5, Reporting Category 6)
- I.16 Writes persuasive texts to influence the attitudes or actions of a specific audience on specific issues* (Testable on the English I STAAR, Reporting Category 5)
- I.17 Understands the function of and uses the conventions of academic language when speaking

- and writing* (Testable on the English I STAAR, Reporting Category 6)
- I.18 Writes legibly and uses appropriate capitalization and punctuation conventions in their compositions* (Testable on the English I STAAR, Reporting Category 6)
- I.19 Spells correctly* (Testable on the English I STAAR, Reporting Category 6)
- I.20 Asks open-ended research questions and develops a plan for answering them
- I.21 Determines, locates, and explores the full range of relevant sources addressing a research question and systematically records the information they gather
- I.23 Organizes and presents their ideas and information according to the purpose of the research and their audience
- I.24 Uses comprehension skills to listen attentively to others in formal and informal settings
- I.25 Speaks clearly and to the point, using the conventions of language

English II

- II.1 Understands new vocabulary and uses it when reading and writing* (Testable on the English II STAAR, Reporting Category 1)
- II.2 Analyzes, makes inferences, and draws conclusions about theme and genre in different cultural, historical, and contemporary contexts and provides evidence from the text to support their understanding* (Testable on the English II STAAR, Reporting Category 1, Reporting Category 2)
- II.8 Analyzes, makes inferences, and draws conclusions about the author's purpose in cultural, historical, and contemporary contexts and provides evidence from the text to support their understanding* (Testable on the English II STAAR, Reporting Category 3)
- II.9 Analyzes, makes inferences, and draws conclusions about expository text and provides evidence from text to support their understanding* (Testable on the English II STAAR, Reporting Category 1, Reporting Category 3)
- II.12 Uses comprehension skills to analyze how words, images, graphics, and sounds work together in various forms to impact meaning* (Testable on the English II STAAR, Reporting Category 2, Reporting Category 3)
- II.13 Uses elements of the writing process (planning, drafting, revising, editing, and publishing) to compose text* (Testable on the English II STAAR, Reporting Category 4, Reporting Category 5, Reporting Category 6)
- II.14 Writes literary texts to express their ideas and feelings about real or imagined people, events, and ideas
- II.16 Writes persuasive texts to influence the attitudes or actions of a specific audience on specific issues* (Testable on the English II STAAR, Reporting Category 4, Reporting Category 5)
- II.18 Writes legibly and uses appropriate capitalization and punctuation conventions in their compositions* (Testable on the English II STAAR, Reporting Category 6)
- II.20 Asks open-ended research questions and develops a plan for answering them
- II.21 Determines, locates, and explores the full range of relevant sources addressing a research question and systematically records the information they gather

- II.23 Organizes and presents their ideas and information according to the purpose of the research and their audience
- II.24 Uses comprehension skills to listen attentively to others in formal and informal settings
- II.25 Speaks clearly and to the point, using the conventions of language

English III

- III.1 Understands new vocabulary and uses it when reading and writing* (Testable on the English III STAAR, Reporting Category 1)
- III.2 Analyzes, makes inferences, and draws conclusions about theme and genre in different cultural, historical, and contemporary contexts and provides evidence from the text to support their understanding* (Testable on the English III STAAR, Reporting Category 2)
- III.12 Uses comprehension skills to analyze how words, images, graphics, and sounds work together in various forms to impact meaning* (Testable on the English III STAAR, Reporting Category 2, Reporting Category 3)
- III.13 Uses elements of the writing process (planning, drafting, revising, editing, and publishing) to compose text* (Testable on the English III STAAR, Reporting Category 4, Reporting Category 5, Reporting Category 6)
- III.14 Writes literary texts to express their ideas and feelings about real or imagined people, events, and ideas
- III.16 Writes persuasive texts to influence the attitudes or actions of a specific audience on specific issues* (Testable on the English III STAAR, Reporting Category 4, Reporting Category 5)
- III.18 Writes legibly and uses appropriate capitalization and punctuation conventions in their compositions* (Testable on the English III STAAR, Reporting Category 6)
- III.20 Asks open-ended research questions and develops a plan for answering them
- III.21 Determines, locates, and explores the full range of relevant sources addressing a research question and systematically record the information they gather
- III.23 Organizes and presents their ideas and information according to the purpose of the research and their audience
- III.24 Uses comprehension skills to listen attentively to others in formal and informal settings
- III.25 Speaks clearly and to the point, using the conventions of language

English IV

- IV.1 Understands new vocabulary and uses it when reading and writing
- IV.2 Analyzes, makes inferences, and draws conclusions about theme and genre in different cultural, historical, and contemporary contexts and provides evidence from the text to support their understanding
- IV.6 Understands, makes inferences, and draws conclusions about the varied structural patterns and features of literary nonfiction and provides evidence from text to support their understanding
- IV.8 Analyzes, makes inferences, and draws conclusions about the author's purpose in cultural,

	historical, and contemporary contexts and provides evidence from the text to support their understanding
IV.11	Understands how to glean and uses information in procedural texts and documents
IV.12	Uses comprehension skills to analyze how words, images, graphics, and sounds work together in various forms to impact meaning
IV.13	Uses elements of the writing process (planning, drafting, revising, editing, and publishing) to compose text
IV.15	Writes expository and procedural or work-related texts to communicate ideas and information to specific audiences for specific purposes
IV.17	Understands the function of and uses the conventions of academic language when speaking and writing
IV.18	Writes legibly and uses appropriate capitalization and punctuation conventions in their compositions
IV.20	Asks open-ended research questions and develops a plan for answering them
IV.21	Determines, locates, and explores the full range of relevant sources addressing a research question and systematically record the information they gather
IV.23	Organizes and presents their ideas and information according to the purpose of the research and their audience
IV.24	Uses comprehension skills to listen attentively to others in formal and informal settings
IV.25	Speaks clearly and to the point, using the conventions of language

Texas College and Career Readiness Standards

This unit may address the following Texas College and Career Readiness Standards:

English Language Arts:

I.A.1	Determines effective approaches, forms, and rhetorical techniques that demonstrate understanding of the writer's purpose and audience
I.A.2	Generates ideas and gathers information relevant to the topic and purpose, keeping careful records of outside sources
I.A.3	Evaluates relevance, quality, sufficiency, and depth of preliminary ideas and information, organize material generated, and formulate thesis
I.A.4	Recognizes the importance of revision as the key to effective writing
I.A.5	Edits writing for proper voice, tense, and syntax, assuring that it conforms to standard English, when appropriate
II.A.1	Uses effective reading strategies to determine a written work's purpose and intended audience
II.A.2	Uses text features and graphics to form an overview of informational texts and to determine where to locate information

- II.A.3 Identifies explicit and implicit textual information, including main ideas and author's purpose
- II.A.4 Draws and supports complex inferences from text to summarize, draw conclusions, and distinguish facts from simple assertions and opinions
- II.A.5 Analyzes the presentation of information and the strength and quality of evidence used by the author and judge the coherence and logic of the presentation and the credibility of an argument
- II.A.8 Compares and analyzes how generic features are used across texts
- II.A.11 Identifies, analyzes, and evaluates similarities and differences in how multiple texts present information, argue a position, or relate a theme
- II.B.1 Identifies new words and concepts acquired through study of their relationships to other words and concepts
- II.B.2 Applies knowledge of roots and affixes to infer the meanings of new words
- II.D.1 Describes insights gained about oneself, others, or the world from reading specific texts
- III.A.1 Understands how style and content of spoken language varies in different contexts and influences the listener's understanding
- III.A.2 Adjusts presentation (delivery, vocabulary, length) to particular audiences and purposes
- III.B.1 Participates actively and effectively in one-on-one oral communication situations
- III.B.2 Participates actively and effectively in group discussions
- III.B.3 Plans and delivers focused and coherent presentations that convey clear and distinct perspectives and demonstrate solid reasoning
- IV.A.1 Analyzes and evaluates the effectiveness of a public presentation
- IV.A.2 Interprets a speaker's message; identifies the position taken and the evidence in support of that position
- IV.A.3 Uses a variety of strategies to enhance listening comprehension
- IV.B.1 Listens critically and responds appropriately to presentations
- IV.B.2 Listens actively and effectively in one-on-one communication situations
- IV.B.3 Listens actively and effectively in group discussions
- V.A.1 Formulates research questions
- V.A.2 Explores a research topic
- V.A.3 Refines research topic and devises a timeline for completing work
- V.B.1 Gathers relevant sources
- V.B.2 Evaluates the validity and reliability of sources
- V.B.3 Synthesizes and organizes information effectively
- V.B.4 Uses source material ethically
- V.C.1 Designs and presents an effective product

Mathematics:

- I.B.1 Performs computations with real and complex numbers
- I.C.1 Uses estimation to check for errors and reasonableness to solutions

- IV.D.2 Applies probabilistic measures to practical situations to make an informed decision
- V.B.1 Computes and interprets the probability of an event and its complement
- V.B.2 Computes and interprets the probability of conditional and compound events
- VI.A.1 Plans a study
- VI.B.1 Determines types of data
- VI.B.2 Selects and applies appropriate visual representations of data
- VI.B.4 Describes patterns and departure from patterns in a set of data
- VIII.A.1 Analyzes given information
- VIII.B.2 Uses various types of reasoning

Science:

- I.A.1 Utilizes skepticism, logic, and professional ethics in science
- I.A.2 Uses creativity and insight to recognize and describe patterns in natural phenomena
- I.A.3 Formulates appropriate questions to test understanding of natural phenomena
- I.A.4 Relies on reproducible observations of empirical evidence when constructing, analyzing, and evaluating explanations of natural events and processes
- I.B.1 Designs and conducts scientific investigations in which hypotheses are formulated and tested
- I.C.1 Collaborates on joint projects
- I.E.1 Uses several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic
- II.E.1 Understands descriptive statistics
- II.F.1 Selects appropriate Standard International (SI) units and prefixes to express measurements for real-world problems
- III.D.1 Uses search engines, databases, and other digital electronic tools effectively to locate information
- III.D.2 Evaluates quality, accuracy, completeness, reliability, and currency of information from any source
- IV.A.1 Recognizes how scientific discoveries are connected to technological innovations

Social Studies:

- I.E.3 Analyzes how social institutions function and meet the needs of society
- I.F.1 Uses a variety of research and analytical tools to explore questions or issues thoroughly and fairly
- I.F.2 Analyzes ethical issues in historical, cultural, and social contexts
- IV.A.1 Identifies and analyzes the main idea(s) and point(s) of view in sources
- IV.A.2 Situates an informational source in its appropriate contexts
- IV.A.3 Evaluates sources from multiple perspectives
- IV.A.4 Understands the differences between a primary and secondary source and use each appropriately to conduct research and construct arguments

- IV.A.5 Reads narrative texts critically
- IV.A.6 Reads research data critically
- IV.B.1 Uses established research methodologies
- IV.B.3 Gathers, organizes, and displays the results of data and research
- IV.B.4 Identifies and collects sources
- IV.C.1 Understands/interprets presentations critically
- IV.D.1 Constructs a thesis that is supported by evidence
- IV.D.2 Recognizes and evaluates counter-arguments
- V.A.1 Uses appropriate oral communication techniques depending on the context or nature of the interaction
- V.A.2 Uses conventions of standard written English
- V.B.1 Attributes ideas and information to source materials and authors

Cross-Disciplinary Standards:

- I.A.1 Engages in scholarly inquiry and dialogue
- I.A.2 Accepts constructive criticism and revise personal views when valid evidence warrants
- I.B.1 Considers arguments and conclusions of self and others
- I.B.2 Constructs well-reasoned arguments to explain phenomena, validate conjectures, or support positions
- I.B.3 Gathers evidence to support arguments, findings, or lines of reasoning
- I.B.4 Supports or modifies claims based on the results of an inquiry
- I.C.1 Analyzes a situation to identify a problem to be solved
- I.C.2 Develops and applies multiple strategies to solving a problem
- I.C.3 Collects evidence and data systematically and directly relate to solving a problem
- I.D.1 Self-monitors learning needs and seeks assistance when needed
- I.D.2 Uses study habits necessary to manage academic pursuits and requirements
- I.D.3 Strives for accuracy and precision
- I.D.4 Perseveres to complete and master tasks
- I.E.1 Works independently
- I.E.2 Works collaboratively
- I.F.1 Attributes ideas and information to source materials and people
- I.F.2 Evaluates sources for quality of content, validity, credibility, and relevance
- I.F.3 Includes the ideas of others and the complexities of the debate, issue, or problem
- I.F.4 Understands and adheres to ethical codes of conduct
- II.A.1 Uses effective prereading strategies
- II.A.2 Uses a variety of strategies to understand the meanings of new words
- II.A.3 Identifies the intended purpose and audience of the text
- II.A.4 Identifies the key information and supporting details
- II.A.5 Analyzes textual information critically

- II.A.6 Annotates, summarizes, paraphrases, and outlines texts when appropriate
- II.A.7 Adapts reading strategies according to structure of texts
- II.A.8 Connects reading to historical and current events and personal interest
- II.B.1 Writes clearly and coherently, using standard writing conventions
- II.B.2 Writes in a variety of forms for various audiences and purposes
- II.B.3 Composes and revises drafts
- II.C.1 Understands which topics or questions are to be investigated
- II.C.2 Explores a research topic
- II.C.3 Refines research topic based on preliminary research and devise a timeline for completing work
- II.C.4 Evaluates the validity and reliability of sources
- II.C.5 Synthesizes and organize information effectively
- II.C.6 Designs and presents an effective product
- II.C.7 Integrates source material
- II.C.8 Presents final product
- II.D.1 Identifies patterns or departures from patterns among data
- II.D.2 Uses statistical and probabilistic skills necessary for planning an investigation and collecting, analyzing, and interpreting data
- II.D.3 Presents analyzed data and communicate findings in a variety of formats
- II.E.1 Uses technology to gather information
- II.E.2 Uses technology to organize, manage, and analyze information
- II.E.3 Uses technology to communicate and displays findings in a clear and coherent manner
- II.E.4 Uses technology appropriately

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