

CURRICULUM OVERVIEW

STEM and Problem Solving

Career and Technical Education Series



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STEM and Problem Solving Course Overview

Science, technology, engineering, and math (STEM) are active components in the real world. This course will outline how to apply the concepts and principles of scientific inquiry, encouraging the use of problem-solving and critical-thinking skills to produce viable solutions to problems. Students will learn the scientific method, how to use analytical tools and techniques, how to construct tests and evaluate data, and how to review and understand statistical information. This course is designed to help students understand what we mean by problem solving and to help understand and develop skills and techniques to create solutions to problems. Advanced problem-solving course stresses analytic skills to properly format problem statements, use of the scientific method to investigate problems, the use of quantitative and qualitative approaches to construct tests, and an introduction to reviewing and interpreting statistical information.

- Introduction to Problem Solving: Students will be introduced to problem solving, which borrows many elements from the scientific method.
- Critical Thinking and Problem Solving: Students will learn to understand and define critical thinking and use logical reasoning to construct an argument.
- **Professional Research and the Scientific Method**: Students will learn to evaluate different types of studies as descriptive or explanatory.
- **Design a Research Project**: Students will learn to define a research population, and the necessary steps for creating a sample.
- Reviewing and Interpreting Statistical Information and Research Data: This unit explores how researchers rarely use all collected data. Because original data must be edited before analysis, researchers turn to common statistical tests to study variable relationships.

	Unit	Unit 1: Introduction to Problem Solving					
	Assig	Assignments					
and Problem Solving	1.	Course Overview	11.	Project: Forming Categories and Setting			
	2.	What is Problem Solving?		Benchmarks			
	3.	Project: Applying Problem-Solving Steps to Global	12.	Analyze Solutions in a Team Setting, Implement a			
		Issues		Strategy, and Review Results			
	4.	Understanding a Problem - Discerning Data and	13.	Quiz 2: Problem-Solving Strategies, Creating a Plan,			
		Identifying Gaps		Implementing, and Review			
	5.	Project: Fact Gathering to Research Global Issues	14.	Special Project*			
LEM	6.	Principles of the Problem Statement	15.	Test			
S	7.	Quiz 1: Principles of Problem-Solving	16.	Course Project Part 1: Energy Use at Your Facility			
	8.	Evaluating Problem-Solving Strategies		and Setting Benchmarks*			
	9.	Project: Technical Problems and Complex Problems	17.	Glossary and Credits			
	10.	Explore Steps to Generate Solutions to a Problem					

Unit 2: Critical Thinking and Problem Solving Assignments STEM and Problem Solving Importance and Development of Critical Thinking Project: Evaluate Reason and Fallacies 1. 10. Skills Developing Critical Judgments for Thinking and 11. 2. Project: Tasks for Better Critical Thinking Analyzing Validity of a Statement 3. Arguments, Inductive and Deductive Reasoning 12. Quiz 2: Applying Critical Thinking in Problem Premises and Conclusions 4. Solving Project: Building an Argument 13. Special Project* 5. Quiz 1: Principles of Critical Thinking 6. 14. Test 7. **Evaluating Statements** 15. Course Project Part 2: Presenting Your Argument Project: Design a Survey for an Energy Efficiency Program* 8. Syllogisms and Fallacies **Glossary and Credits** 9. 16.

Unit 3: Professional Research and the Scientific Method

Assignments

STEM and Problem Solving	1.	Observation and Scientific Inquiry					
	2.	Data-Gathering Methods and Reducing Bias					
	3.	Project: Performing Observational and Survey					
		Research					
	4.	Review Research Studies Using Various					
		Methodologies to Compare and Contrast Data					
	5.	Project: Analyze Reports to Understand Data					
		Collection					
	6.	Quiz 1: Professional Research Methodology and					
		Scientific Research					
	7.	From Observation to Problem Statements					
	8.	Project: Research Proposal					

- 9. Quantitative, Qualitative, and Mixed Method Research Design
- 10. Project: Statistical Models: Making Graphs and Charts
- 11. Principles of the Problem Statement
- 12. Quiz 2: Scientific Study Methods and Analysis
- 13. Special Project*
- 14. Test
- 15. Course Project Part 3: Building a Research Proposal for Energy-Saving Options*
- 16. Glossary and Credits

Unit 4: Design a Research Project

Assignments **STEM and Problem Solving Research Problems and Populations** Research Constructs and Research with People 1. 10. **Project: Problems and Populations** Project: Studies with People 2. 11. Overview of Sampling, Data Collection, and Data 12. Quiz 2: Overview of Sampling, Data Collection, and 3. Analysis Data Analysis 4. Project: Sampling and Planning 13. Special Project* Validating Data 14. Test 5. Quiz 1: Define a Population and a Sampling Method Course Project Part 4: Choosing the Population and 15. 6. Areas for Your Study* 7. Define a Population and a Sampling Method 8. **Collecting Data** 16. Glossary and Credits 9. Project: Design an Experiment

	Unit 5: Reviewing and Interpreting Statistical Information and Research Data				
Solving	Assignments				
	1.	Using Statistics to Analyze Data	11.	Peer Review: Evaluate the Research Project and	
	2.	Selecting Statistical Tests and Software		Results	
em	3.	Project: Coding Data and Statistical Analysis	12.	Quiz 2: Evaluating Conclusions and Reporting	
ldo'	4.	Evaluating Statistical Results		Research Results	
d Pr	5.	Project: Testing a Hypothesis	13.	Special Project*	
an	6.	Quiz 1: Collect and Interpret Data Using Statistics	14.	Test	
EM	7.	Final Evaluation of Study and Results	15.	Course Project Part 5: Calculating and Coding	
ST	8.	Project: Preparing a Standard Research Paper		Research Data from All Research*	
	9.	Reporting Results	16.	Glossary and Credits	
	10.	Project: Analyzing Research Studies in the Media			

	Unit	Unit 6: Course Project, Review, and Exam				
Assignments						
	1.	Course Project Part 6: Preparing and Presenting a	2.	Review		
		Proposal for an Energy Efficiency Program*	3.	Exam		

(*) Indicates alternative assignment