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| **TEXAS CTE LESSON PLAN**[www.txcte.org](http://www.txcte.org) |
| **Lesson Identification and TEKS Addressed** |
| **Career Cluster** | Science, Technology, Engineering & Mathematics |
| **Course Name** | Concepts of Engineering and Technology |
| **Lesson/Unit Title** | Introduction to Problem Solving |
| **TEKS Student Expectations** | **130.402. (c) Knowledge and Skills** (6) The student thinks critically and applies fundamental principles of system modeling and design to multiple design projects. (A) The student is expected to identify and describe thefundamental processes needed for a project, including the design process and prototype development and initiating,planning, executing, monitoring and controlling, and closing a project(C) The student is expected to use problem-solvingtechniques to develop technological solutions(D) The student is expected to use consistent units for allmeasurements and computations |
| **Basic Direct Teach Lesson**(Includes Special Education Modifications/Accommodations and one English Language Proficiency Standards (ELPS) Strategy) |
| **Instructional Objectives** | The students will be able to:* Define problem solving
* Identify four steps in the problem solving process: understanding the problem, devising a plan, carrying out the plan, and looking back
* Create an original problem solving Pictionary, using the example and characters provided
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| **Rationale** | After completing this lesson, students will be able to define problem solving, identify four steps in the problem solving process and create their own problem solving Pictionary, matching the criteria in the example provided. |
| **Duration of Lesson** | This lesson should take two 45 minute periods. |
| **Word Wall/Key Vocabulary***(ELPS c1a,c,f; c2b; c3a,b,d; c4c; c5b) PDAS II(5)* | * Problem Solving
* Problem Solving Process
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| **Materials/Specialized Equipment Needed** | **Instructional Aids:*** PowerPoint presentation
* Dictionary

**Materials Needed:*** Paper
* Pencil
* Problem solving definition handout
* Problem solving Pictionary handouts (slides 2 and 12)
* Problem solving quiz
* Problem solving quiz key

**Equipment Needed:*** Computer
* Overhead projector
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| **Anticipatory Set**(May include pre-assessment for prior knowledge) | * **SAY:** Today we are going to discuss problem solving and four steps that make up the problemsolving process.
* **ASK:** Does anyone know what is meant by problem solving?
* **SAY**: It is a mental process that’s part of the larger problem process that includes problem finding and problem solving.
* **ASK**: Can anyone state a problem in your own words?
* **SHOW:** Let’s look at the problem solving Pictionary in the slide presentation. (Slide 2)
* **SAY:** After we go through the problem solving process in the slide presentation, you will have achance to make your own Pictionary to solve a problem of your choice.
* **SAY:** Keep it simple but don’t be limited to four steps (you might want to break each part intosub sets).
* **SHOW:** The last slide. (Slide 11)
* **SAY:** Use this example to make your own problem solving Pictionary. You may use thecharacters in this example to make your own characters. Finally, you will move the characters until you get the idea that solves your problem.
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| **Direct Instruction \*** | Outline | Instructor Notes |
| I. Problem Solving DefinedA. A mental process that is part of the larger problem process.B. Considered the most complex of all intellectual functions.C. Defined as higher-order cognitive process.D. Occurs when an organism or artificial intelligence system needs to move from a given state to a desired state.II. Problem Solving ProcessA. Understanding the problem.B. Devising a plan.C. Carrying out the plan.D. Looking back.III. Step 1 - Understanding the ProblemA. State problem in your own words.B. What are you trying to find or do?C. What are the unknowns?D. What information do you obtain from the problem?E. What information is missing?F. What information is not needed?IV. Step 2 - Devising a PlanA. Look for a pattern.B. Examine related problems.C. Examine a simpler or special case of the problem.D. Make a table.E. Make a diagram.F. Write an equation.G. Use guess and check.H. Work backwards.I. Identify a sub goal. V. Step 3 - Carrying Out The PlanA. Implement the strategy or strategies in Step 2B. Check each step as you proceed.C. Keep an accurate record of work. VI. Step 4 - Looking BackA. Check results in original problem.B. Interpret the solution in terms of original problem.C. Determine if there is another method of finding the solution.D. Determine other related or more general problems for which the techniques will work.VII. StoryboardA. Students will make their own Pictionary.B. Four steps and sub steps of the problem solving process.C. Use characters from example Pictionary.D. Move pictures until you get the idea that solves the problem.E. Look at it from forward, backwards. | * Teacher begins PowerPoint presentation and distributes the Problem Solving Definition handout.
* Teacher points out Pictionary slide 2 showing the four steps of the process with characters.
* As the students are working, the teacher reminds them to think of things that relate to them in their everyday lives that could be problems.
* Using one of the problems stated, the teacher can ask the students questions B-F.
* The teacher explains that the strategies listed, although not exhaustive, are very useful. Have students look for a tool, a part, the main support, and ask how was it done?
* During this step of the process, you will make simple sketches and keep a record.
* Teacher reinforces that people have different interpretations and that no idea is a bad idea.
* Continue PowerPoint presentation.
* Teacher introduces the storyboard and reminds the students to refer to the example at the beginning of the presentation (slide 2); and use the example at the end of the presentation to create their own Pictionary (slide 11). Students will use the Problem Solving Definition handout as a reminder of what is included in each of the four steps of the process.
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| **Guided Practice \*** | After class presentation, the teacher will demonstrate how to use the examples from the storyboard and the Problem Solving Definition handout to create the Pictionary of their choice. |
| **Independent Practice/Laboratory Experience/Differentiated Activities \*** | Following the storyboard provided in the lesson, students will use abstract thinking to identify at least four steps of the problem solving process and select characters that best depict each step of the process. |
| **Lesson Closure** | * Question: What is the process of problem solving?
* Answer: The process is: 1) understanding the problem; 2) devising a plan; 3) carrying out the plan; and 4) looking back.
* Question: What do you do when you identify barriers while trying to solve a problem?
* Question: How will problem solving help you with the project?
* Answer: It helps you to structure your thinking to get it right.
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| **Summative/End of Lesson Assessment \***  | * The teacher will observe the students as they are working on the problem solving Pictionary they are creating.
* The students will create a problem solving Pictionary with four steps and multiple sub steps for the problem they choose to solve and complete the Problem Solving Quiz.
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| **References/Resources/****Teacher Preparation** | **Teacher Preparation:*** Understand the four steps and sub steps in the problem-solving process and prepare the PowerPoint presentation for the lesson

**References:*** Billstein, R., Libeskind, S., and Lott, J. (2010). A Problem Solving Approach to Mathematics for
* Elementary School Teachers. Boston: Addison-Wesley.
* Wikipedia.com
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| **Additional Required Components** |
| **English Language Proficiency Standards (ELPS) Strategies** |  |
| **College and Career Readiness Connection[[1]](#footnote-1)** |  |
| **Recommended Strategies** |
| **Reading Strategies** |  |
| **Quotes** |  |
| **Multimedia/Visual Strategy****Presentation Slides + One Additional Technology Connection** |  |
| **Graphic Organizers/Handout** |  |
| **Writing Strategies****Journal Entries + 1 Additional Writing Strategy** |  |
| **Communication****90 Second Speech Topics** |  |
| **Other Essential Lesson Components** |
| **Enrichment Activity**(e.g., homework assignment) | * Paper towers, card towers, paper bridges
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| **Family/Community Connection** |  |
| **CTSO connection(s)** | SkillsUSATechnology Student Association  |
| **Service Learning Projects** |  |
| **Lesson Notes** |  |

1. Visit the Texas College and Career Readiness Standards at <http://www.thecb.state.tx.us/collegereadiness/CRS.pdf>, Texas Higher Education Coordinating Board (THECB), 2009. [↑](#footnote-ref-1)