### Solving the problem.

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<td>Fishbone Problem Solving</td>
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<tr>
<td>Used to identify the causes of a complex system or event. It is a visual illustration that shows the relationship between a topic and the various factors associated with it. The shape of the diagram looks like the skeleton of a fish.</td>
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<tr>
<td>4 Corners and a Diamond</td>
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<td>A problem solving strategy used to brainstorm different thoughts and ideas, clarify those ideas, and then compare and contrast the pros and cons related to the problem and its possible solutions.</td>
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<td>Consider Your Options</td>
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<tr>
<td>Uses a flowchart format to have students individually state the problem, list the identified constraints and limitations heard in the video, and then think and note a possible solution. After talking with a peer about another solution, students determine which solution seems best to them.</td>
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<td>Inquiry-Based Learning</td>
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<tr>
<td>Helps students to identify and restate a problem, work toward a possible solution, and then re-evaluate the solution based on constraints, limitations, advantages and disadvantages. There are two different templates provided for your use with students:</td>
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<tr>
<td>- Block format graphic organizer</td>
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<td>- Flow chart</td>
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<td>Scientific Method</td>
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<td>Refers to a five step process for investigating observable facts, acquiring new knowledge, or correcting and integrating prior knowledge.</td>
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<td>Value-Based Problem Solving</td>
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<td>Uses a graphic organizer to state the problem, list some possible solutions, discuss the consequences of this solution and decide if the consequences would be pros or cons, and then determine the importance of the consequence.</td>
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<td>“WHAT” is the Answer?</td>
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<tr>
<td>Is a question and answer approach to solving a problem. Working individually and then in pairs, students clearly state the problem, identify constraints related to the problem, and then evaluate possible solutions.</td>
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</table>
Solving the problem.

Fishbone Problem Solving
Fishbone Problem Solving

A fishbone diagram is used to identify the causes of a complex system or event. It is a visual illustration that shows the relationship between a topic and the various factors associated with it. The shape of the diagram looks like the skeleton of a fish. Each bone coming off the spine is broken down into details. The bones of the fish represent factors that have been combined to form categories. The categories, in turn, come together to form the topic that is depicted in the head of the fish.

**TEACHER DIRECTIONS**

- **Overview of Graphic Organizer:** Display the fishbone template and review the steps for completing this cause and effect problem-solving tool.

- **Video Introduction:** Provide a brief background for the video presentation. Watch the video.

- **Group:** Divide students into groups of 4. Direct students to continue working with the fishbone diagram to label the categories using constraints and limitations of the problem/topic in the video presentation. You may want to provide students with generic headings such as methods, machines (equipment), people (manpower), materials, measurement, environment, etc.

- **Discuss:** After identifying the problem, and labeling the categories, discuss the possible causes of the problem in each category. Discuss the term “secondary causes.” Direct students to list causes under each category. Causes can be written in several places if they relate to several categories.

- **Analyze:** Team members agree that an adequate amount of detail has been provided under each major category. Items that appear in more than one category become the most likely causes. Ask students to reach consensus on the most likely causes of the problem. Define root cause. Students can reach consensus on the root cause and/or justify their reasoning.

**STUDENT DIRECTIONS**

- Review the steps of the fishbone graphic organizer.

- Watch the video presentation.

- Agree on a problem statement (effect). Write it in the box labeled, “Effect on Future Plans.” Form groups of 3 or 4. Use the constraints and limitations (or generic categories provided by your teacher) discussed in the video to begin labeling the categories on the fishbone diagram.

- Brainstorm all the possible causes of the problem. Ask yourself, “Why does this happen?” As each idea is shared, write it as a branch from the appropriate category.

- Analyze the results of the fishbone diagram after team members agree that an adequate amount of detail has been provided under each major category. Reach consensus on the most likely causes or the root cause of the problem. Justify your reasoning.
Solving the problem.

4 Corners and a Diamond
4 Corners and a Diamond

There are many useful problem-solving strategies to identify and restate a problem, work toward a possible solution, and then re-evaluate the solution based on constraints, limitations, advantages, and disadvantages. The Teacher Directions and Student Directions will remain the same regardless of the problem-solving strategy chosen.

**TEACHER DIRECTIONS**

- **Before students watch the video,** review the problem-solving strategy to be used.
- **Clarify:** Explain the differences in terms: constraints/limitations and roadblocks/obstacles. Clarify any questions students have related to their task.
- **Video Introduction:** Provide a brief background on the video presentation and introduce the topic. Watch the first segment of the video.
- **Think and Write:**
  1. Direct students to redefine the topic/problem before starting to think about a solution.
  2. Direct students to list what they already know about the problem associated with the topic.
  3. List the constraints and limitations discussed in the video presentation.
- **Groups:** Group students by choice or assignment. Remember to be sensitive to learners’ needs (reading skills, attention skills, language skills) when creating pairs or triads.
- **Problem-Solving Task:** Provide a time limit for students to agree to some possible solutions to the problem considering their responses to #2 and #3. Watch segment 2 of the video. Direct students to identify pros and cons of their proposed solutions. Then, watch segment 3 of the video.
- **Discussion:** Provide discussion time for students to compare the actual solution to their own. Ask questions related to the students’ conclusions about their college and professional goals.

**STUDENT DIRECTIONS**

- **Students will get an overview of the problem-solving strategy to be used.**
- **Clarify:** Ask clarifying questions related to the problem-solving task.
- **Video:** Watch the first segment of the video and take notes that will help to solve the problem. Listen carefully for information related to the constraints and limitations identified by the presenter.
- **Think and Write:**
  1. State the problem identified by the presenter in the diamond at the center of the graphic organizer.
  2. Proceed by listing what you already know about the problem associated with the topic.
  3. List the constraints and limitations related to solving the problem.
- **Group:** Partner or form groups according to the teacher’s direction. Take your graphic organizer and a pencil with you as you form a pair or join a group.
- **Problem-Solving Task:** Work with your partner/group to make sure you have identified the same problem, constraints, and limitations. Take a minute to add anything that you are missing. Now, share and list some possible solutions to the stated problem and discuss the pros and cons of each solution.
- **Share:** Compare and contrast your solution with the one described by the professional expert. Draw conclusions about your college and professional goals.
One approach to solving a problem is to brainstorm different thoughts and ideas when it is first presented. Listen carefully to the problem presented by the professional expert in the video. Using the diagram below:

1. State the problem in the diamond at the center.
2. Organize your thoughts by listing what you already know about the problem associated with the topic.
3. Write the constraints and limitations related to solving the problem.
4. List some workable solutions. Watch the rest of the video.
5. Use the last corner to consider how this real-life problem might relate to your college and work goals.
Solving the problem.

Consider Your Options
Consider Your Options

There are many useful problem-solving strategies to identify and restate a problem, work toward a possible solution, and then re-evaluate the solution based on constraints, limitations, pros, and cons.

<table>
<thead>
<tr>
<th>TEACHER DIRECTIONS</th>
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<tbody>
<tr>
<td>▶ Before students watch the video, review the problem-solving strategy to be used.</td>
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<td>▶ <strong>Clarify:</strong> Explain the difference among terms: constraints/limitations and roadblocks/obstacles. Clarify any questions students have related to their task.</td>
<td>▶ <strong>Clarify:</strong> Ask clarifying questions related to the problem-solving task.</td>
</tr>
<tr>
<td>▶ <strong>Video Introduction:</strong> Provide a brief background to the video presentation and introduce the topic. Watch Segment 1 of the video.</td>
<td>▶ <strong>Video:</strong> Watch Segment 1 of the video and take notes related to the constraints and limitations identified by the presenter.</td>
</tr>
<tr>
<td>▶ <strong>Think and Write:</strong> Direct students to redefine the topic/problem before starting to think about a solution. List the constraints and limitations identified in the video presentation.</td>
<td>▶ <strong>Think and Write:</strong> Redefine the problem on the problem-solving worksheet. List the identified constraints and/or limitations.</td>
</tr>
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<td>▶ <strong>Groups:</strong> Group students by choice or assignment. Remember to be sensitive to learners’ needs (reading skills, attention skills, language skills) when creating pairs or triads.</td>
<td>▶ <strong>Group:</strong> Partner or form groups according to the teacher’s direction.</td>
</tr>
<tr>
<td>▶ <strong>Problem-Solving Task:</strong> Provide a time limit for students to agree on two possible solutions to the problem, considering the constraints/limitations. Watch Segment 2 of the video.</td>
<td>▶ <strong>Problem-Solving Task:</strong> Work with your partner/group to define the problem, state the constraints/limitations, and identify two possible solutions to solve the problem.</td>
</tr>
<tr>
<td>▶ <strong>Evaluate:</strong> Discuss possible consequences, the value of the consequence, and how the constraint or limitation could be eliminated. Watch Segment 3 of the video.</td>
<td>▶ <strong>Evaluate:</strong> Think about the consequences, value of the consequence, and how the constraint or limitation could be eliminated. Watch Segment 3 of the video.</td>
</tr>
<tr>
<td>▶ <strong>Reflection:</strong> Compare students’ solutions to the one presented in the video.</td>
<td>▶ <strong>Reflection:</strong> Pick one of your solutions to share with the class. Compare it to presenter’s solution and be prepared to explain why it is a solution that should be considered.</td>
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</table>
Consider your Options | Student Template

Listen carefully to the problem presented by the professional expert in the video. Using the chart below, restate the problem. List the identified constraints and limitations heard in the video. Individually, think of a possible solution and write it in the box titled Solution 1. Then, turn and talk to a partner about your solution and share your partner’s solution. Write their solution in the box titled Solution 2. On your own, fill in the blanks at the bottom of the page. Be prepared to share your thoughts with the class.

- State the problem:

- Identified constraints and limitations:

Options
What can I do?

- Solution 1:
- Solution 2:

Option Considered

<table>
<thead>
<tr>
<th>Consequences</th>
<th>Value</th>
<th>Support</th>
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<tbody>
<tr>
<td>What might happen if you use this option?</td>
<td>How important is the consequence? Why?</td>
<td>How do you overcome the constraints and limitations for the solution to work?</td>
</tr>
</tbody>
</table>

Name: ___________________________ Video Title: ___________________________ Date: ____________

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Solving the problem.

Inquiry-Based Learning
Inquiry-Based Learning

There are many useful problem-solving strategies that help you to identify and restate a problem, work toward a possible solution, then re-evaluate the solution based on constraints, limitations, advantages, and disadvantages. Review the problem-solving strategy templates.

**TEACHER DIRECTIONS**

- Before students watch the video, review the problem-solving strategy to be used.
- **Clarify:** Explain the differences among terms: constraints/limitations and roadblocks/obstacles. Clarify any questions students have related to their task.
- **Video Introduction:** Provide a brief background on the video presentation and introduce the topic. Watch the first segment of the video.
- **Think and Write:** Direct students to redefine the topic/problem before starting to think about a solution.
- **Pairs or Teams:** Pair or team students by choice or assignment. Remember to be sensitive to learners’ needs (reading skills, attention skills, language skills) when creating pairs or teams.
- **Problem-Solving Task:** Provide a time limit for students as they work on a possible solution to the problem considering constraints/limitations. Provide discussion time to share some thoughts about possible solutions.
- **Discussion:** Provide discussion time for students to share thoughts about possible solutions. Complete the video.

**STUDENT DIRECTIONS**

- Have the students review the directions for the problem-solving strategy being used.
- **Clarify:** Ask clarifying questions related to the problem-solving task.
- **Video:** Watch the first segment of the video and take notes that will help to solve the problem.
- **Think and Write:** Redefine the problem by writing a problem statement on the problem-solving template.
- **Pairs or Teams:** Partner or form small teams according to the teacher’s direction.
- **Problem-Solving Task:** Work with your partner/team to: define the problem, state the constraints/limitations, and identify a possible solution to the problem.
- **Share:** Share your possible solutions with the class. Compare your solution with that of the presenter(s).
- Complete the video.
After the real-world problem has been posed, pause the video. Once the video is paused, begin completing the flow chart. Think about the constraints and limitations as you identify possible solutions to the problem.

**MY OWN THINKING**

- What knowledge and skills can I share that might provide us with the information we need to solve this problem?

**MY PARTNER’S THOUGHTS**

- What knowledge and skills might my partner or group be missing in order to begin solving this problem?
Solving the problem.

The Scientific Method
The traditional Think-Write-Pair-Share strategy is designed to differentiate instruction by providing students time and structure for thinking about a given topic, enabling them to formulate individual ideas and share these ideas with a peer. In this modified strategy, a problem is posed, students have time to think about it individually, write their thoughts, work in pairs to solve the problem, and then share their ideas with the class.

**TEACHER DIRECTIONS**

- Before introducing the Think-Write-Pair-Share strategy to students, develop a set of questions or prompts that target key concepts related to the video.
- Describe the strategy and its purpose with your students, and provide guidelines/question(s) for the discussions that will take place related to the video.
- **Think and Write:** Begin by asking a specific higher-level question about the video or topic/problem for the students to discuss. Have the students think for a given amount of time (usually 1-3 minutes) and then write for a given amount of time (usually another 1-3 minutes).
- **Pair:** Pair each student with a partner either by choice or assignment. Have them discuss their thinking with their partners for a given amount of time (usually 2-5 minutes). Remember to be sensitive to learners’ needs (reading skills, attention skills, language skills) when creating pairs.
- **Share:** Once partners have had ample time to share their thoughts and have a discussion, expand the “share” to a whole-class discussion. After the class “share,” you may choose to have pairs reconvene to talk about how their thinking perhaps changed as a result of the “share” element.
- Using this strategy prior to showing the video allows you the opportunity to adjust your instruction based on what the students share about what they already know.

**STUDENT DIRECTIONS**

- “Think” about what you already know or have learned about the topic/problem for 2 minutes and then take another 3 minutes to “write” those thoughts for later reference.
- Pair with a partner as directed by your teacher. Discuss your thinking with your partner and then ask questions of your partner about their thoughts on the topic for 5 minutes.
- Select the partner who will present your pair’s thoughts, ideas, and questions to the rest of the class. After you “share,” with the class, talk to your partner about how his/her thinking has changed about solving the problem and how this might relate to their own path related to college and future professions.
The Scientific Method | Student Template

Ask Question

Background Research

Hypothesis

Think! Try Again

Test with Experiment

Analyze Results and Draw Conclusions

Hypothesis is TRUE

Hypothesis is FALSE

Report Results
Solving the problem.

Value-Based Problem Solving
Value-Based Problem Solving

There are many useful problem-solving strategies to identify and restate a problem, work toward a possible solution, and then re-evaluate the solution based on constraints, limitations, advantages, and disadvantages.

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<tr>
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<tr>
<td>▶ Before students watch the video, review the problem-solving strategy to be used.</td>
<td>▶ Students will overview the problem-solving strategy to be used.</td>
</tr>
<tr>
<td>▶ <strong>Clarify:</strong> Explain the difference among terms: constraints/limitations and roadblocks/obstacles. Clarify any questions students have related to their task.</td>
<td>▶ <strong>Clarify:</strong> Ask clarifying questions related to the problem-solving task.</td>
</tr>
<tr>
<td>▶ <strong>Video Introduction:</strong> Provide a brief background to the video presentation and introduce the topic. Watch the first segment of the video.</td>
<td>▶ <strong>Video:</strong> Watch the first segment of the video and take notes that will help to solve the problem. Listen carefully for information on the constraints and limitations identified by the presenter.</td>
</tr>
<tr>
<td>▶ <strong>Think and Write:</strong> Direct students to redefine the topic/problem before starting to think about a solution. List the constraints and limitations discussed identified in the video presentation.</td>
<td>▶ <strong>Think and Write:</strong> Redefine the problem by writing a problem statement on the problem-solving worksheet. List the constraints and/or limitations you heard identified.</td>
</tr>
<tr>
<td>▶ <strong>Groups:</strong> Group students by choice or assignment. Remember to be sensitive to learners’ needs (reading skills, attention skills, language skills) when creating pairs or triads.</td>
<td>▶ <strong>Group:</strong> Partner or form groups according to the teacher’s direction.</td>
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<tr>
<td>▶ <strong>Problem-Solving Task:</strong> Provide a time limit for students to agree on two possible solutions to the problem considering constraints/limitations. Provide discussion time to share possible consequences, the value of the consequence (how important is it?) and how the constraint or limitation could be eliminated. Then continue with the video.</td>
<td>▶ <strong>Problem-Solving Task:</strong> Work with your partner/group to: define the problem, state the constraints/limitations, and identify two possible solutions to solve the problem.</td>
</tr>
<tr>
<td>▶ <strong>Share:</strong> Share one of your possible solutions and identify the value of the consequence of your choice. Discuss how it is like or unlike the presenter’s solution and why you think it would be a useful solution to consider.</td>
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One approach to solving a problem is to brainstorm different thoughts and ideas when it is first presented. Listen carefully to the problem presented by the professional expert in the video. State the problem in the blue box below. List some possible solutions (by yourself or with your identified group). Discuss the consequences of this solution and decide if the consequences would be a pro or a con. In the value box, agree on the importance of the consequence and the reason you believe the consequence to be a pro or a con.

| Possible Solutions | Consequences If I adopt this solution? | Pro or Con How important is the consequence? Why? | Value How important is the consequence? Why? |

How does my problem solution compare/contrast to the expert's solution?

Name: ___________________________________  Video Title: ___________________________________  Date: ___________
Solving the problem.

“WHAT” is the Answer?
“WHAT” is the Answer?

There are many useful problem-solving strategies to identify and restate a problem, work toward a possible solution, and then re-evaluate the solution based on constraints, limitations, advantages, and disadvantages.

**TEACHER DIRECTIONS**

› Before students watch the video, review the problem-solving strategy to be used.

› **Clarify:** Explain the difference among terms: constraints/limitations and roadblocks/obstacles. Clarify any questions students have related to their task.

› **Video Introduction:** Provide a brief background to the video presentation and introduce the topic. Watch the video.

› **Think and Write:** Direct students to answer questions #1 and #2 on the graphic organizer. Give students a few minutes to think about prior knowledge.

› **Pairs:** Pair students by choice or assignment. Remember to be sensitive to learners’ needs (reading skills, attention skills, language skills) when creating pairs or triads.

› **Problem-Solving Task:** Ask students to discuss limitations and constraints and provide a time limit for students to agree to a possible solution to the problem considering their answers to #2 and #3. Direct students to identify pros and cons of their proposed solutions.

› **Discussion:** Provide discussion time for students to compare the actual solution to their own. Ask questions related to the students’ conclusions about their college and professional goals.

**STUDENT DIRECTIONS**

› Students will overview the problem-solving strategy to be used.

› **Clarify:** Ask clarifying questions related to the problem-solving task.

› **Video:** Watch the video and take notes that will help to solve the problem. Listen carefully for information on the constraints and limitations identified by the presenter.

› **Think and Write:** Answer questions #1 and #2 independently. Think about what you already know and brainstorm any prior knowledge related to the topic and problem.

› **Pairs:** Pair according to the teacher’s direction. Take your graphic organizer and a pencil with you as you form a pair.

› **Problem-Solving Task:** Work with your partner to make sure you have identified the problem and shared your prior knowledge. Take a minute to add anything that you are missing. Recall the limitations and constraints from the video. Decide on a possible solution and describe the solution pros and cons.

› **Share:** Compare and contrast your solution with the one described by the expert. Draw conclusions about your college and professional goals. Turn and talk to a partner to share next steps or future goals.
“WHAT” Is the Answer? | Student Template

One approach to solving a problem is to brainstorm different thoughts and ideas. Listen carefully to the problem presented by the professional expert in the video. Using the below, answer questions #1 and #2 independently. Then, with a partner, answer questions #3 and #4. After viewing Segment 3 of the video, work with your partner to discuss the expert’s solution (#5), including how it compares to your solution. The last question is an individual reflection. Talk to a partner about your next steps. Be prepared to share with the class.

› 1. What problem is presented in the video?

› 4. What is a possible solution to this problem?

› 2. What do I already know that will help me solve the problem?

› 5. How did the expert solve the problem?
   How does this solution compare to yours?

› 3. What are the constraints and limitations to solving this problem?

› 6. What does this topic/problem/solution have to do with my professional or college goals? What will my next step be?