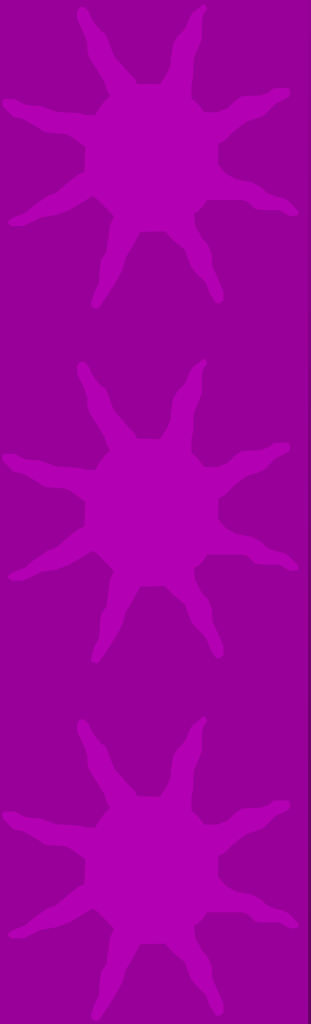




# *PBL workshop*

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Presented by:  
Gloria Elena Faus  
Ana Belén Ibarra



# *What is PBL?*

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- ★ **Problem-based learning (PBL) is a curriculum development and instructional approach.**

## **What does PBL do in math learning?**

- ★ **When the PBL scenario demands students a mathematical model to obtain a solution of a problem, it develops in them critical, analytical and reflexive thinking abilities, as well as the logical-mathematical reasoning.**



## *How does PBL do it?*

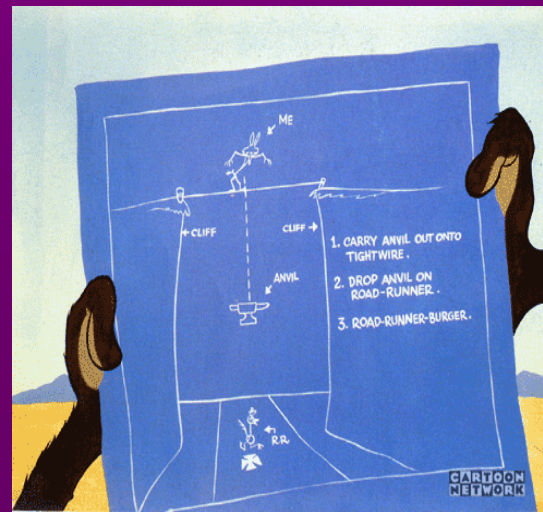
- ★ **By placing students in the active role of problem-solvers confronted with an ill-structured problem which mirrors real-world problems. This demands a greater effort when searching for information, its analysis and mathematical language interpretation.**



# Examples of math ill-structured problems used in PBL

## ★ Coyote & Roadrunner

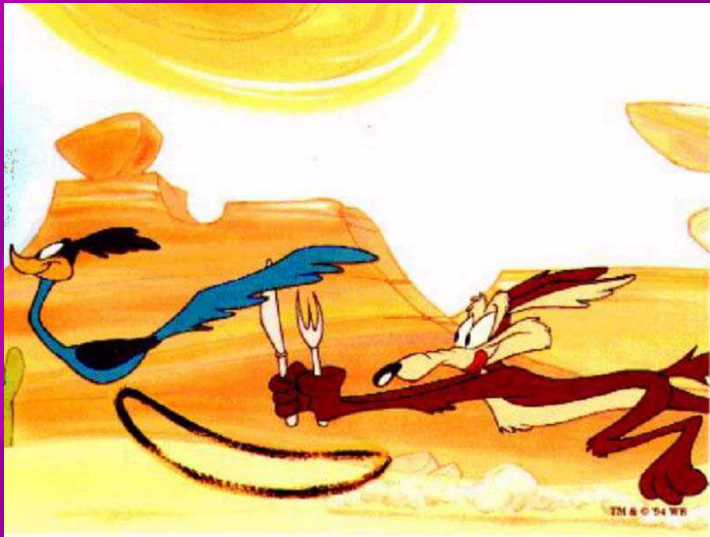
- ★ The Coyote always tries to hunt the roadrunner and he never gets it. He is frustrated and starved. They live in a strange and dangerous place, with mountains and cliffs.





*How could we help the coyote to catch the roadrunner at least once on time?*

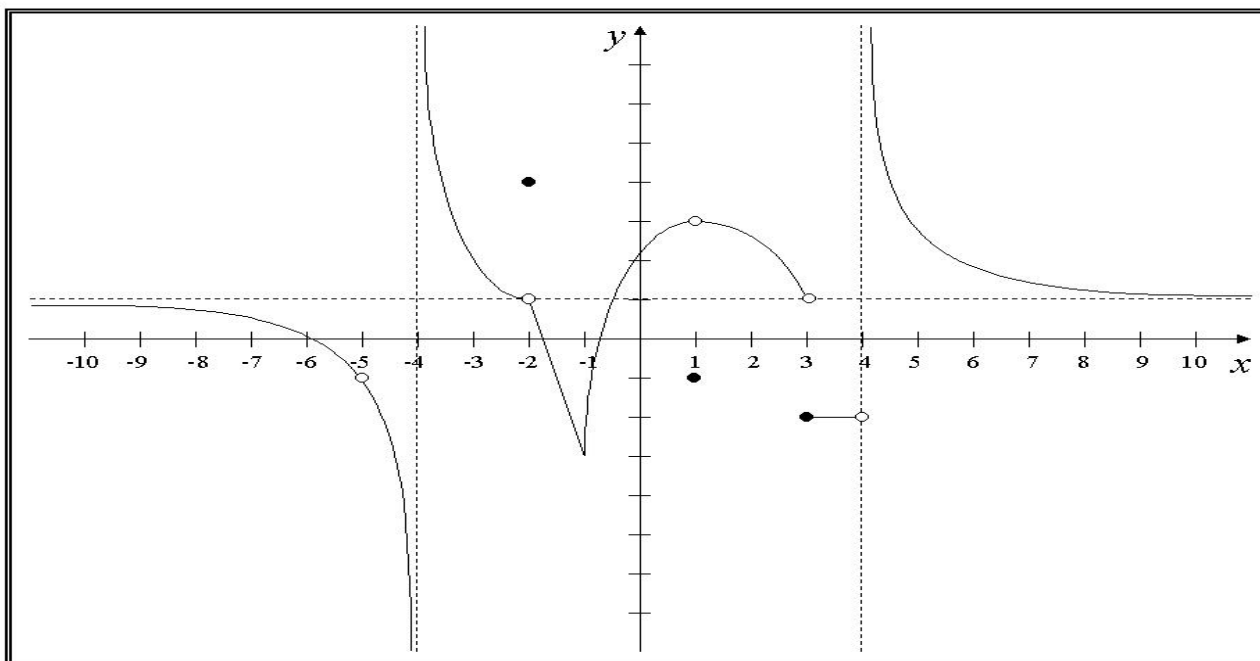
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# *Map of the place where Coyote and Roadrunner live*

- ★ The Looney road has some “Looney-safe” holes (these points stand for roadrunner) on which road runner falls down to reappear somewhere else. It would be useful for the Coyote to find out where these holes are located, the place where road runner could reappear, and how close he can approach the holes without losing the roadrunner. The Coyote wants to know if there exists a math approach to fine the holes problem.





# Eight steps for PBL

**1. Read and analyze  
the problem scenario**

**2. List hypotheses,  
ideas, or hunches**

**3. List what you  
already know**

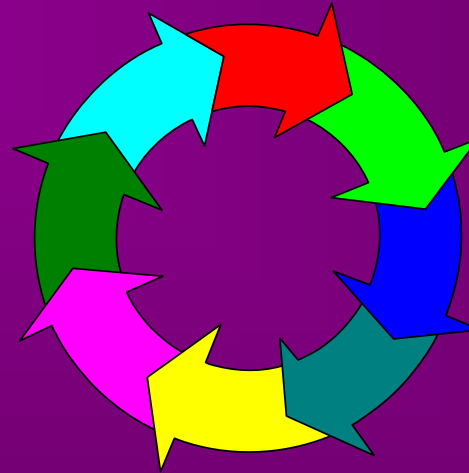
**4. List what is unknown**

**5. List what needs  
to be done**

**6. Develop a problem  
statement**

**7. Gather information**

**8. Present  
findings**





# 1. Read and analyze the problem scenario

- ★ Check your understanding of the scenario by discussing the scenario with your team.
- ★ Don't be tempted to start thinking about potential solutions or to start looking for information.







# List hypotheses, ideas, or hunches

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- ★ With the little that you know, what do you think will happen?
- ★ List your ideas or hypotheses on the **board** and them **ORGANIZED BY PRIORITY** on your Student Activity Sheet.





## 3. List what you already know

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- ★ Begin your list with the information contained in the scenario.
- ★ Add knowledge shared by other group members.
- ★ Record this information under the heading: “What do we know?” on the Student Activity Sheet.



## 4. List what is unknown:

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- ★ Prepare a list of questions your group thinks need to be answered to solve the problem.
- ★ Record them under the heading: “What do we need to know?”



## 5. List what needs to be done

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- ★ List possible actions to be taken under the heading: “What should we do?”. Such actions may include questioning an expert, getting online data, or visiting a library to find answers to the questions developed in Step 4.
- ★ Prioritize the questions you are going to seek answers to, then divide up the questions among your team.



## 6. Develop a problem statement

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- ★ A problem statement is a one- or two-sentence idea that clearly identifies what your team is trying to solve, produce, respond to, test, or find out. **Is recommended that you follow the next steps:**
  - **Identify the possible solutions that can be applied to solve the problem.**
  - **Select the most feasible solution, remember that the solutions are changing and tentative, depending on what information is collected and how it is interpreted.**
  - **Justify the selected hypothesis.**
  - **Record your statement.**



## 7. Gather information:

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- ★ You and your team will gather, organize, analyze, and interpret information from multiple sources.
- ★ Exchange ideas; think about solutions; weigh alternatives; and consider the pros and cons of potential courses of action.
- ★ Record your information and resources.



## 8. Present findings:

- ★ Prepare a report or presentation in which you and your group make recommendations, predictions, inferences, or other appropriate resolutions of the problem. **Remember it is necessary to present the outline to your teacher in order to received feedback from your teacher**
- ★ Be prepared to support your positions. **Your positions will be presented in the class.** If appropriate, consider a multimedia presentation using images, graphics, or sound.



# PBL Scenario Essentials Rubric

Source: Dr. James A. Botti, <[jbotti@cet.edu](mailto:jbotti@cet.edu)> & Mat. Carlos Astengo Noguez  
[castengo@itesm.mx](mailto:castengo@itesm.mx)

## *Essential Elements of PBL Scenarios*

### Problem Structure

#### *Maximum*

#### *Minimum*

The scenario paints the problem in a real-world, authentic context with a twist, paradox, and/or controversy.

The scenario contains a real-world problem that begs for action or resolution.

The scenario connects the subject to a real-world problem outside of school.

The scenario is relevant to the course but is not connected to problems outside the classroom.





# Essential Elements of PBL Scenarios

## Authenticity

*Maximum*

*Minimum*

The scenario contains a messy and complex problem that can be formulated only if the learners work together.

The scenario contains a loosely structured problem that can't be formulated without some research and collaboration.

The scenario contains a problem that is neither well structured nor explicit but can be found easily after reading the scenario several times.

The problem embedded within the scenario is well structured and can easily be found.



# Essential Elements of PBL Scenarios

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## Curricular Relevance

*Maximum*

*Minimum*

**The scenario establishes the need to understand essential course content.**

**The scenario is built around opportunities for learning key course content.**

**The scenario engages learners in course content.**

**The scenario provides limited opportunities for learners to engage in course content.**



# Essential Elements of PBL Scenarios

## Learner Relevance

*Maximum*

*Minimum*

The scenario contains a hook that raises learner interest in solving the problem.

The scenario contains seeds of interest and roles that learners can relate.

The scenario contains tasks that are realistic and achievable, but the learners have no stake in solving the problem.

The scenario is interesting but not realistic.



# Essential Elements of PBL Scenarios

## Ways and Means

*Maximum*

*Minimum*

The scenario is open ended and beyond the learners' immediate capabilities, requiring inquiry for appropriate methods and information.

Not all the information is given, nor do the learners have enough prior knowledge to solve the problem.

All the needed information relevant to a solution is embedded as key concepts that change little with the addition of new information.

Ways and means are given before the problem.



# Essential Elements of PBL Scenarios

## Thinking Requirements

*Maximum*

*Minimum*

Requires higher order thinking and consideration of integrated and multidisciplinary ideas.

Requires thinking and reasoning skills to justify all decisions and reasoning based on the principles being learned.

Requires inquiry, information-gathering, and reflection.

Requires straightforward, lower-order thinking.



# Essential Elements of PBL Scenarios

## Potential Solutions

*Maximum*

*Minimum*

<p>The solution is changing and tentative, depending on what information is collected and how it is interpreted.</p>	<p>More than one solution is likely and may change with additional information.</p>	<p>Situation requires consideration of more than one solution; solutions unlikely to change with additional information.</p>	<p>Has an identifiable, closed-ended solution.</p>
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# PBL

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Design your PBL scenario according to the rubric





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