Problem Centered Teaching by Tomorrow

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Illinois Mathematics and Science Academy
Session Objectives

- Identify the **three** main characteristics of problem centered teaching and learning
- Explore **four** simple strategies to incorporate problem centered instruction into daily lessons
- Consider the correlation between problem centered instruction and **educator** performance

Post-Session Objective

- Use the strategies discussed to **create** or **transform** a single lesson, activity, or worksheet into a problem centered learning experience
IMSA'S CORE COMPETENCIES

COMPETENCY DRIVEN

INQUIRY BASED

PROBLEM CENTERED

INTEGRATIVE
Problem centered learning experiences are those in which learners grapple with problems, and work toward their resolution.
Problem centered learning experiences are those in which learners grapple with complex, and problems, and work toward their resolution.
Problem centered learning experiences are those in which learners grapple with complex, meaningful, and problems, and work toward their resolution.
Problem centered learning experiences are those in which learners grapple with COMPLEX, MEANINGFUL, and OPEN ENDED problems, and work toward their resolution.
History of Problem Centered Instruction
History of Problem Centered Instruction
History of Problem Centered Instruction
PRESENTS THE MATERIAL IN A REALISTIC, APPLICABLE WAY

ENCOURAGES STUDENTS TO TAKE CHARGE OF THEIR OWN LEARNING

TAKES ADVANTAGE OF STUDENTS' NATURAL CURIOSITY

ENCOURAGES 'LEARNING HOW TO LEARN'
TIERED LEVELS OF PROBLEM CENTERED INSTRUCTION

Semester Based
- Full Problem/Guided Immersion
- 4-6 Week Immersion

Unit Based
- Mastery of one concept

Topic Based
- Replacing a rote memorization/repetition/short answer/cookbook lab with a real life problem that allows students to apply the concept
EXAMPLE SITUATION

You are hosting a barbecue that starts very soon and you want to make as many biscuits as possible with the ingredients you already have.
Dan Meyer
'Three-Act Tasks'

Robert Kaplinsky
'Open Middle'
1. Make the Content Relatable

"WHEN ARE WE EVER GOING TO USE THIS??"
Changing matter

Background knowledge
When you mix substances together, they may change to form a new substance. Sometimes the change is reversible, while at other times it is irreversible. For example, when vinegar is mixed with baking soda, the two fizz and a new substance is formed. This change is irreversible. A change is more likely to be irreversible if there is a reaction such as a fizz, color change, or a change in temperature.

Science activity
Are the following mixing processes reversible or irreversible?
1. Dissolving sugar in water
2. Shaking together vinegar and oil
3. Mixing sand and sugar
4. Adding lemon juice to red cabbage juice
   (the color changes from bluish-purple to red)

Science investigation
Try mixing the following substances together, and decide whether the change is reversible or irreversible. Do any mixtures result in a temperature change? Explain.
1. Lemon juice added to baking powder
2. Vinegar added to chalk
3. Vinegar added to salt
4. Lemon juice added to sugar
INVESTIGATE: CHANGING MATTER

ARE THE FOLLOWING REVERSIBLE OR IRREVERSIBLE?
WHAT EVIDENCE SUPPORTS YOUR DECISION?

- DISSOLVE SUGAR IN WATER
- SHAKE UP VINEGAR AND OIL
- MIX SAND AND SUGAR
- MIX LEMON JUICE WITH RED CABBAGE JUICE
- MIX LEMON JUICE AND BAKING POWDER
- ADD VINEGAR TO CHALK
- ADD VINEGAR TO SALT
- ADD LEMON JUICE TO SUGAR
They 'made soup' with water and mom's new olive oil from Italy.

Dumped a box of Alka-Seltzer into a pot of water that had been left on the stove.

Made Kool-Aid using 3x more sugar than needed.

While keeping an eye on your little sibling, you ran to your room to get your homework. When you came back, they had ransacked the kitchen. Below is a list of the worst of the damage—Is any of it salvageable??
2. Structure: Less is More

LET THE STUDENTS GUIDE THE PROCESS
noun

1. a matter or situation regarded as unwelcome or harmful and needing to be dealt with and overcome.
   "they have financial problems"

Similar: difficulty, issue, trouble, worry, complication

- a thing that is difficult to achieve or accomplish.
  "motivation of staff can also be a problem"

- denoting or relating to people whose behavior causes difficulties to themselves and others.
  "practitioners help families develop strategies for managing problem behavior in teens"
noun: problem; plural noun: problems

1. a matter or situation regarded as unwelcome or harmful and needing to be dealt with and overcome.
   "they have financial problems"

Similar: difficulty, issue, trouble, worry, complication

- a thing that is difficult to achieve or accomplish.
  "motivation of staff can also be a problem"

- denoting or relating to people whose behavior causes difficulties to themselves and others.
  "practitioners help families develop strategies for managing problem behavior in teens"
They 'made soup' with water and mom's new olive oil from Italy.

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While keeping an eye on your little sibling, you ran to your room to get your homework. When you came back, they had ransacked the kitchen. Below is a list of the worst of the damage--is any of it salvageable??

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- Made Kool-Aid using 3x more sugar than needed.
Annotated Example Problem Template: Step-by-Step Guide

**Topic**

**PROBLEM**

**STEP 1**

**STEP 2**

**STEP 3**

**STEP 4**

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**Steps to Writing Instructions**

- **Steps**
  - Step 1
  - Step 2
  - Step 3
  - Step 4

- **Explain**
  - Explain 1
  - Explain 2
  - Explain 3
  - Explain 4

**List the materials needed**

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**GRAPHIC ORGANIZERS**
3. Be a Resource, not the Answer Key

NEVER GIVE A STUDENT A DIRECT ANSWER
Before You Answer a Question

- Can you find the information in a textbook?
- Is it something you can research online?
- Have you tried?
- Have you brainstormed? (with yourself or others?)
- Have you asked a neighbor?
- Can you find a video about the topic?
- Have you read the directions?
- Have you listed out what you already know about the topic?
Before You Answer a Question

What Do YOU Think?
4. Use the problem to Introduce a topic

ONCE STUDENTS ARE COMFORTABLE WITH PROBLEM CENTERED LEARNING, USE PROBLEMS TO INTRODUCE A TOPIC RATHER THAN ASSESS IT
While keeping an eye on your little sibling, you ran to your room to get your homework. When you came back, they had ransacked the kitchen. Below is a list of the worst of the damage—is any of it salvageable??

- They 'made soup' with water and mom's new olive oil from Italy
- Dumped a box of Alka-Seltzer into a pot of water that had been left on the stove
- Made Kool-Aid using 3x more sugar than needed
THEY ‘MADE SOUP’ WITH WATER AND MOM’S NEW OLIVE OIL FROM ITALY. DUMPED A BOX OF ALKA-SELTZER INTO A POT OF WATER THAT HAD BEEN LEFT ON THE STOVE. MADE KOOL-AID USING 3X MORE SUGAR THAN NEEDED.

WHILE KEEPING AN EYE ON YOUR LITTLE SIBLING, YOU RAN TO YOUR ROOM TO GET YOUR HOMEWORK. WHEN YOU CAME BACK, THEY HAD RANSACKED THE KITCHEN. BELOW IS A LIST OF THE WORST OF THE DAMAGE--IS ANY OF IT SALVAGEABLE??

- THEY ‘MADE SOUP’ WITH WATER AND MOM'S NEW OLIVE OIL FROM ITALY.
- DUMPED A BOX OF ALKA-SELTZER INTO A POT OF WATER THAT HAD BEEN LEFT ON THE STOVE.
- MADE KOOL-AID USING 3X MORE SUGAR THAN NEEDED.
STUDENT BENEFITS AND GOALS

PRESENTS THE MATERIAL IN A REALISTIC, APPLICABLE WAY

ENCOURAGES STUDENTS TO TAKE CHARGE OF THEIR OWN LEARNING

TAKES ADVANTAGE OF STUDENTS' NATURAL CURiosity

ENCOURAGES 'LEARNING HOW TO LEARN'
Teacher Benefits

STRONG PEDAGOGY

ENGAGEMENT FOR ALL

STUDENT LEARNING
### 1b: Demonstrating Knowledge of Students

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Teacher makes little or no attempt to acquire knowledge of students’ backgrounds, skills, or interests, and does not use such information in planning.</td>
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<tr>
<td>2</td>
<td>Teacher demonstrates partial knowledge of students’ backgrounds, skills, and interests, and attempts to use this knowledge in planning for the class as a whole.</td>
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<tr>
<td>3</td>
<td>Teacher demonstrates thorough knowledge of students’ backgrounds, skills, and interests, and uses this knowledge to plan for groups of students.</td>
</tr>
<tr>
<td>4</td>
<td>Teacher demonstrates thorough knowledge of students’ backgrounds, skills, and interests, and uses this knowledge to plan for individual student learning.</td>
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Encourages students to take charge of their own learning

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<tr>
<th>3c: Engaging Students in Learning</th>
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<td>Students are not at all intellectually engaged in significant learning, as a result of inappropriate activities or materials, poor representations of content, or lack of lesson structure.</td>
</tr>
<tr>
<td>Students are intellectually engaged only partially, resulting from activities or materials of uneven quality, inconsistent representations of content, or uneven structure or pacing.</td>
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<tr>
<td>Students are intellectually engage throughout the lesson, with appropriate activities and materials, instructive representations of content, and suitable structure and pacing of the lesson.</td>
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<tr>
<td>Students are highly engaged throughout the lesson and make material contributions to the representation of content, the activities, and the materials. The structure and pacing of the lesson allow for student reflection and closure.</td>
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<td>2b: Establishing a Culture for Learning</td>
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Encourages 'learning how to learn'

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<tr>
<th>3b: Using Questioning and Discussion Techniques</th>
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<td>Teacher makes poor use of questioning and discussion techniques, with low-level questions, limited student participation, and little true discussion.</td>
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<tr>
<td>Teacher’s use of questioning and discussion techniques is uneven, with some high-level questions, attempts at true discussion, and moderate student participation.</td>
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<tr>
<td>Teacher’s use of questioning and discussion techniques reflects high-level questions, true discussion, and full participation by all students.</td>
</tr>
<tr>
<td>Students formulate many of the high-level questions and assume responsibility for the participation of all students in the discussion.</td>
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THANK YOU

PLEASE REACH OUT WITH QUESTIONS/COMMENTS/COLLABORATION!


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