Using PBL to Integrate Instruction in the Common Core in Math, Science, and ELA

Kathy Schmidt, Illinois Mathematics and Science Academy

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Partners in Student Pathways

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• Hands on experience
• Need/desire to know
• Enthusiasm and passion
• Some prior knowledge
• Failure leads to improvement
• Teaching others
• Watching experts
• Break into smaller steps
• Feedback and reflection

How Learning Happens:

Think of something you’ve learned well....

How did that happen?

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How Learning Happens:

- Australia
- Canada
- China
- France
- Hong Kong
- Mexico
- Pakistan
- Singapore
- South Korea

- Alabama
- Arizona
- Colorado
- Connecticut
- Florida
- Georgia
- Idaho
- Illinois
- Indiana
- Iowa
- Kentucky
- Louisiana
- Massachusetts
- Michigan
- Missouri
- Montana
- Nebraska
- Nevada
- New Jersey
- New York
- North Dakota
- Ohio
- Oklahoma
- Pennsylvania
- South Carolina
- Tennessee
- Texas
- Utah
- Virginia
- Washington
- Washington D.C.
- West Virginia
- Wisconsin

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Learner’s Perspective of the PBL Process

Identify Know and Need to Know

<table>
<thead>
<tr>
<th>Know</th>
<th>Need to Know</th>
<th>Need to Do</th>
</tr>
</thead>
</table>

Define the Problem

<table>
<thead>
<tr>
<th>Overall Task</th>
<th>Here’s what I think</th>
<th>Here’s what we (pair) think</th>
<th>Here’s what our group thinks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factors to Consider</td>
<td>How can we... in such a way that we consider...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prepare the Learners

Teachers pave the way for PBL by establishing a classroom environment conducive to collaboration.
Meet the Problem

Students encounter a messy problem that engages their interest and compels them to need to know more.

Identify Know and Need to Know

The group generates lists:
- What we know
- What we need to know
- What we need to do

Define the Problem

Students list the Task to be completed and the Factors for successful completion.

Gather Information

Learners gather information from multiple and varied resources to resolve their need to knows.

Share Information

Students share information they have gathered with their group and discuss its relevance to the problem.
Gather and Share Information

Internet Research

Hands-on Inquiry

Experts

Refine Problem Statement

Generate Solution Elements

Students synthesize the information to find solution elements which fit the factors in their problem statement.
**Determine Best Fit Solution**
Students develop a graphic organizer to find a solution which fits the factors in their problem statement.

**SWOT Analysis**
- Strengths
- Weaknesses
- Opportunities
- Threats

**Decision Matrix**
- Pros
- Cons
- Long-term effects

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**Present the Solution**
Students present their solution to and get feedback from a real-world stakeholder in the problem.

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**Debrief . . . the Presentation**
Learners debrief the presentation to emphasize learning from other groups’ presentations.

“I loved how we were able to bring the information that we learn in class to the real world. It made us think outside of the box and it was something that none of my teachers have ever done before.”

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**Debrief . . . the Problem**
Learners debrief the problem and the process to emphasize the curriculum and group skills learned.

I liked that this unit called for a lot of thinking and creativity ... this unit made us use all parts of our brain and then mix it together to find solutions.

I liked how it was a real-world situation/challenge. It was logical problem solving for a worthwhile cause.

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**Stages of PBL, Science and Engineering Practices, Mathematical Practices, and College and Career Readiness in Reading, Writing, Speaking, Listening, and Language**

<table>
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<th>Stage of PBL</th>
<th>Science and Engineering Practices</th>
<th>Mathematical Practices</th>
<th>College and Career Readiness in ELA</th>
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</thead>
<tbody>
<tr>
<td><strong>Present the Solution</strong></td>
<td>Science and engineering professionals and educators</td>
<td>Students design and implement a solution using the full range of science and engineering practices</td>
<td>Students communicate their solution through effective oral and written presentations, and articulate the importance of the problem-solving process.</td>
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<td><strong>Debrief . . . the Problem</strong></td>
<td>Standards of Practice: Design and Construct Evidence, Comprehend as Well as Critique, Demonstrate Independence, Build Strong Content Knowledge, Comprehend as Well as Critique</td>
<td>Students engage in collaborative discussions to reflect on the processes and outcomes of the problem-solving activity.</td>
<td>Students are able to articulate the importance of the problem-solving process and its relevance to their future careers.</td>
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PBL Resources

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