Problem-Based Learning 101
Using the Power of Story to Drive the Curriculum

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1.
The **ONLY** Reason to
Alter Curriculum
for Gifted Students
Their learning needs are different because they are different.
The Gifted Mind

Rapid Learning
Conceptual Thinking
Inquiry
Intensity/Openness
Intelligence

OPENNESS to Experience

Creativity

Moral Reasoning

Beliefs

Emotional Awareness

Ideas

Values

Action

Fantasy

Feeling

Aesthetics

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>Sensing</th>
<th>Intuition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normative Group</td>
<td>9,320</td>
<td>68.1</td>
<td>31.9</td>
</tr>
<tr>
<td>Sak, 2004</td>
<td>5,834</td>
<td>28.4</td>
<td>71.7</td>
</tr>
<tr>
<td>Cross et al., 2007</td>
<td>931 gifted high school students</td>
<td>31.1</td>
<td>68.9</td>
</tr>
<tr>
<td>Folger et al., 2003</td>
<td>96 college honors students</td>
<td>34.4</td>
<td>65.6</td>
</tr>
<tr>
<td>Lysy &amp; Piechowski, 1983</td>
<td>44 graduate students</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>McCaulley, 1976</td>
<td>1001 National Merit Finalists</td>
<td>17.6</td>
<td>82.4</td>
</tr>
<tr>
<td>Ruf &amp; Radosevich, 2009</td>
<td>124 gifted youth and adults</td>
<td>16.1</td>
<td>83.9</td>
</tr>
<tr>
<td>MacKinnon, 1978</td>
<td>120 (approx) creative scientists, mathematicians, architects, writers</td>
<td>4</td>
<td>96</td>
</tr>
</tbody>
</table>
2.
BECAUSE

they are DIFFERENT

our GOALS are Different
What are the Aims of Gifted Education?
A Journey to Expertise

Knowledge
Thinking Skills
Problem-Solving
Metacognition
Tolerance for Ambiguity
Passion
Medical School Model
## Learning Issues Board

**Hunches:**
- We aren’t going to get more funding
- Less resilience?

<table>
<thead>
<tr>
<th>What do we know?</th>
<th>What are our Learning Issues?</th>
<th>What is our Action Plan?</th>
</tr>
</thead>
<tbody>
<tr>
<td>BFF needs to be reintroduced successfully and quickly</td>
<td>1. Who is funding now</td>
<td></td>
</tr>
<tr>
<td>Needs to be quicker</td>
<td>2 What are we spending</td>
<td></td>
</tr>
<tr>
<td>Currently labor intensive and $</td>
<td>3 Where are we currently looking</td>
<td></td>
</tr>
<tr>
<td>We haven’t been successful</td>
<td>4 How much labor</td>
<td></td>
</tr>
<tr>
<td>Bad press, not supporting us</td>
<td>5 What caused the GB? 6 What went wrong before?**</td>
<td></td>
</tr>
<tr>
<td>We are in Ft. Collins, CO</td>
<td>7 what are the other inhabitants</td>
<td></td>
</tr>
<tr>
<td>Current strains on the economy</td>
<td>of the prairie?</td>
<td></td>
</tr>
<tr>
<td>There was a genetic bottleneck</td>
<td>8 ** What are the needs of the BFF?</td>
<td></td>
</tr>
<tr>
<td>reduced DNA</td>
<td>9 What is Ft Collins is like right now?</td>
<td></td>
</tr>
<tr>
<td>BFFRRRT—our role, to reintroduce</td>
<td>10 what’s the fit between Ft. C</td>
<td></td>
</tr>
<tr>
<td>Identify changes in two weeks</td>
<td>11 Why are we doing this?** what are the implications of not</td>
<td></td>
</tr>
<tr>
<td>Present a reintroduction model</td>
<td>12 What will be impact be on the area?</td>
<td></td>
</tr>
<tr>
<td>Keep track of unexpected factors</td>
<td>13 Human “climate” ?, how to get buy in</td>
<td></td>
</tr>
<tr>
<td>Niche = job done in ecosystem</td>
<td>(MEDIA)</td>
<td></td>
</tr>
<tr>
<td>US Firsh and Wildlife</td>
<td>14 Rabid activists on either side?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 What is the land being used for?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16 What is the prairie ecosystem?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What’s the ferret’s role/pediator prey?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17 What is a niche…the BFF niche</td>
<td></td>
</tr>
<tr>
<td></td>
<td>18 Where were the ferrets successful before?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19. Is Ft. Collins native territory for a BFF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 We aren’t going to get more funding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Less resilience?</td>
<td></td>
</tr>
</tbody>
</table>
Observations

All responses validated
Build off each other
Scaffolded and classified
The problem was in an authentic format
Felt like it was coming from the kids

Questions

Why group think on the first day?
Organization?
More about younger kids?
Design?
“Tangent”
**What is “Problem-Based Learning”?**

A form of inquiry-based education, *originally invented for medical school*, where learning is initiated with an ill-structured problem and students *learn to* direct their own course of study.
Premature closure on a productive question can destroy imagination.
Jerome Bruner:

Experiencing Subject Matter from an Expert’s Perspective

Oversimplification and dogmatism are the twin enemies of creative thought.
Jerome Bruner:

Experiencing Subject Matter from an Expert’s Perspective

Concepts are worthless unless they lead children to new explorations.
Jerome Bruner:
Experiencing Subject Matter from an Expert’s Perspective

Answers have a way of killing thought.
Elements of Problem-Based Learning

- Ill-Structured Problem
- Problem-Based Learning
- Stakeholder
- Metacognitive Coach
Ill-Structured Problems
Ill-Structured Problems

...cannot be defined with a high degree of completeness

...cannot be solved with a high degree of certainty

(King & Kitchener, 1994)
Ill-Structured Problems

The Center of Expert Activity
Ill-Structured Problems
Educational Benefits

Content Knowledge
Process Knowledge
Multiple Solution Paths
Choice and Decision Making
Evaluative Thinking
Metacognition
A Story

Realistic Fiction

Mystery
Stories
Data with a Soul
Dr. Brene Brown
A Story

Neural Synthesis of Cognition and Affect
Paul Zak

More memorable than Other Narratives
Greaser
Growth is Rooted in the Story
Critical thinking only occurs in the face of perceived need.

Recognizing the NEED to think precedes all thinking.
YOU are the STORYTELLER

They are the PROTAGONIST
To Whom It May Concern:

For many years I have worked with environmentalists to find ways to both raise my cattle and keep the local wildlife in their home ground. It hasn’t always been easy, but I don’t feel the same way as some of my more hostile neighbors. I don’t support plinking or poisoning.

However, when my three-year-old’s puppy came home yesterday with a lump the size of an egg under its chin, I was forced to reconsider. I remember just a couple of years ago when this happened to my cousin’s cat—it was the plague, and it hit not only the prairie dogs, but three cats in her neighborhood. Some of those families have children, and they were really scared about what might have happened if they hadn’t stopped the disease in time.

It’s one thing to ask us to take the risk of having cattle break their legs in prairie dog holes, but it’s another thing altogether to ask me to put my child’s life at risk of a horrible disease by allowing the prairie dogs to live close to humans.

I realize that we haven’t had that plague problem in a while, but even if our pup doesn’t have plague, it’s just not worth the risk to my family. If you can’t promise me my family will be safe, I can’t support your efforts.

Respectfully submitted,

Bob Livingston
Hi, guys. It’s Pete calling. We just finished the count of released BFFs in the field for this week, and I wanted you to know that I noticed something kind of weird. Two out of seven seemed to be limping, and another one had a scabbed-over ear like it had been cut or something. Otherwise they didn’t seem all that sick. No lumps or anything…but still, I’m worried. They were suffering, and it was keeping them from getting around well. I thought you’d want to know.

I gotta go. I have to get all these burrs off of me before I meet with Dr. Ladner this afternoon.
An Immersion in Significant Content through an Expert’s Point of View
An Apprentice
Apprenticeship
The purpose of an **APPRENTICESHIP** is to provide both *hands-on training* and *theoretical instruction* so that an interested person can learn the *full range of skills and information* behind a *highly skilled occupation*. By participating in an apprenticeship, he can learn the *subtleties* of the craft from an expert and can begin *his own practice* *under close observation*.

*[Read more: Apprentice Definition | eHow.com](http://www.ehow.com/about_5445995_apprentice-definition.html#ixzz2NLz72qOW)*
In the best curriculum a student acts as a hero willing to become an unknown self.
Ill-Structured Problems

Story

Biologist

Engineer

Journalist

Town Elder

Task Force

Entomologist

Congress

Vet

Biologist

Engineer

Journalist
Transportation Theory

Empathy

Investment

The Danger of Detachment
Complex emotional feelings like interest, inspiration, indignation or compassion ... pertain ... to abstract inferences, interpretations and ideas.

*Emotions, Learning, and the Brain*, Mary Helen Immordino-Yang
“It is ... neurobiologically impossible to think deeply about things that you don’t care about.”

Emotions, Learning, and the Brain, Mary Helen Immordino-Yang
NOT a Simulation

All Students Joining in a Single Perspective
Community of Practice

...a *group of people* who *share a concern or a passion* for something they do, and *learn how to do it better* as they *interact regularly*.

(Wenger & Trainer, 2011)
Metacognitive Coach
Cruise Director

Organize Activities
Manage Level of Difficulty
Keep the Story Alive

Socrates

Helping Students Think
Building Intellectual Toolbox
Encouraging Independence
A PLAN
3.
It’s NOT the **MODEL**, it’s what **GOES IN** the **MODEL**

(but models ARE helpful guides)
PBL
is NOT
Inherently Appropriate for Gifted Students
Goals of Problem-Based Learning

Core Content
Problem Solving
Conceptual Reasoning
Research
Thinking Skills
Ethics
Dispositions/Metacognition
The Flow of the Problem

Engagement

Inquiry and Investigation

Problem Definition

Problem Resolution

Problem Debriefing
Engagement

Problem Definition

Problem Resolution

Inquiry and Investigation

Problem Debriefing

Content: Biology and Habitats

Process: Perspective Taking

Concepts: Systems

Primary

Research Strategies

Questioning

Socratic Seminars

Communication

Organizing Information

Collaboration/Consensus
Embedded Instruction

• Research Skills
  – Primary Resources
  – Maps
  – Experimentation
• Analysis
  – Comparing/Contrasting Points of View
  – Direct and Indirect Effects
  – Analyzing Consequences
• Creating Criteria
• Comparing Options
Problem Engagement
1. The BFFRRRT

Inquiry and Investigation
1. Ferret Facts (research)
2. Habitat Threats
3. Systems and Risk
4. What’s the Source
5. Problem Definition

Resolution
1. The Model
2. Presentation

Debriefing
1. Review/Reflect/Extend

(Laying out the Plan...)

(Ferret Math)

(Genetic Bottleneck)
Investigation
Date: 
To: All Team Members 
From: Mitchell Ladner, US Fish and Wildlife Service 
Subject: Ft. Collins Project

By now your work is well underway on this project. I would like to know about your findings, your ideas about the direction we should take to optimize the success of our reintroduction efforts, and a description of any issues you’ve encountered thus far. Please send me a written response with your thoughts to date. I’ll expect your update by tomorrow.

❖ Problem Log

Reflective Moment: A Letter to the Boss

Write a letter to Mitchell Ladner providing him with the requested update.

A quality response includes: 1) a header 2) a salutation, 3) a body of at least two paragraphs, each presenting a major idea that is supported by facts, and 4) a closing.
Inquiry
Critical thinking!

**Problem Log**

**Determining Causes**

Directions: Use this space to record the cause-effect relationships among the Critical Components from the Black-Footed Ferrit Habitat Chart. Use arrows to connect each fact to its prior cause. If there is a Critical Component that you think is important, but not directly connected, included in the chart but don't connect it to other Critical Components. Feel free to add boxes as needed.

- Distant Causes
- Prior Causes
- Immediate Causes
- Current Situation
Critical Thinking!
Genetic Bottleneck Demonstration

Teacher Reference
Conceptual Reasoning
CONCEPTS: MORE than just a BIG IDEA

Responsibility
Systems

Elements of a system must all operate in appropriate balance and proportion.

When one element of a system is at risk, the entire system is at risk.

Elements of a system must all function correctly, or the system will break down.
Problem Definition
Problem Definition

Issue(s)  Constraint(s)

FORMAT:

How Can We ............

in a Way That ...........
I'm not trying to prohibit helicopter traffic, I'm just trying to establish some regulatory framework to try and improve quality of life in a way that doesn't impede law enforcement, and at the same time provides some relief for my constituents.
Format for Problem Definition

What’s the Problem?

Write the class consensus problem definition in the box below.

Class Problem Definition:

How can we...

In a way that...

Issues

Constraints
Constraints
Creativity
Problem Resolution
Criteria-Based Decision Making

**Problem Log**

Name: 

**Problem Definition:**

---

**Problem Resolution Grid**

**PROBLEM RESOLUTION GRID**

*Instructions:* List the criteria for a good problem solution in the left-hand column. List your options across the top row (only use the number of rows necessary). Next, rate how well each solution option addresses the different criteria using a 3-point scale, in which 1 is *Matches Very Well* and 3 is *Matches Very Poorly*. Total the ratings for each solution option.

<table>
<thead>
<tr>
<th>Solution Criteria</th>
<th>Solution Options</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Criteria-Based Decision Making**

Sample Problem Resolution Grid

*Problem Definition:* How can we create a self-sustaining model black-footed ferret habitat in a way that minimizes contact with home owners and helps ranchers?

**Problem Resolution Grid**

*Instructions:* List the criteria for a good problem solution in the left-hand column. List your options across the top row (only use the number of rows necessary). Next, rate how well each solution option addresses the different criteria using a 3-point scale, in which 1 is *Matches Very Well* and 3 is *Matches Very Poorly*. Total the ratings for each solution option.

<table>
<thead>
<tr>
<th>Solution Options</th>
<th>Provide Protected Area for Prairie Dogs</th>
<th>Vaccinate Black-Footed Ferrets</th>
<th>Relocate Prairie Dogs to National Park Area</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-Sustaining Model</strong></td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>


Culminating Activities

Present their Model

Newspaper Editorial
Assessment

- The Problem Log
- Classroom Rubrics
Problem Engagement
1. The BFFRRT

Inquiry and Investigation
1. Ferret Facts (research)
2. Habitat Threats
3. Systems and Risk
4. What’s the Source
5. Problem Definition

Resolution
1. The Model
2. Presentation

Debriefing
1. Review/Reflect/Extend

Laying out the Plan...

(Ferret Math)

(Genetic Bottleneck)
Four Components of the Problem Log

• Content
• Process
• Analysis
• Reflection
# Presentation Rubric

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Exemplary</th>
<th>At Standard</th>
<th>In Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Visuals</strong></td>
<td>Visuals are relevant and add to the viewer's understanding of the topic</td>
<td>Visuals are related to the topic</td>
<td>Visuals are not relevant or nonexistent</td>
</tr>
<tr>
<td><strong>Use of Information</strong></td>
<td>Information is accurate, and detail shows understanding of complex ideas</td>
<td>Information is accurate and sufficiently detailed</td>
<td>Information is inaccurate or vague</td>
</tr>
<tr>
<td></td>
<td>Information is relevant to assignment and is of high quality</td>
<td>Information is sufficient and generally relevant</td>
<td>Information is insufficient and/or irrelevant</td>
</tr>
<tr>
<td><strong>Use of Sources</strong></td>
<td>Information is relevant to assignment and is of high quality</td>
<td>Gets information from correct number of relevant sources</td>
<td>Gets information from irrelevant, low-quality sources</td>
</tr>
<tr>
<td></td>
<td>Identifies and discusses bias in own data</td>
<td>Identifies bias at the most basic level</td>
<td>Does not discuss possible bias</td>
</tr>
<tr>
<td><strong>Presenter Quality</strong></td>
<td>Uses conversational tone and obviously understand material thoroughly</td>
<td>Speaks from notes or memory using a comfortable tone; shows basic understanding</td>
<td>Reads from notes and shows little or no understanding</td>
</tr>
<tr>
<td></td>
<td>Poised and confident</td>
<td>Generally poised and confident</td>
<td>Appears indifferent, anxious, or nervous</td>
</tr>
<tr>
<td></td>
<td>Answers questions clearly and thoroughly</td>
<td>Responds to most questions with clarity</td>
<td>Does not know answers to questions</td>
</tr>
<tr>
<td><strong>Collaboration (If applicable)</strong></td>
<td>Shares time equitably with colleagues</td>
<td>Shares time but runs over or takes others' points</td>
<td>Runs over time and/or makes other presenters' points</td>
</tr>
<tr>
<td></td>
<td>Listens respectfully when not speaking</td>
<td>Listens most of the time</td>
<td>Does not listen, whispers during other presentations</td>
</tr>
<tr>
<td><strong>Overall Presentation Quality</strong></td>
<td>Presentation is well-organized and is structured to be interesting</td>
<td>Presentation is organized and fulfills all aspects of the assignment; organization is logical</td>
<td>Presentation is not organized and does not fulfill all aspects of the assignment</td>
</tr>
</tbody>
</table>

Name: ___________________________ Date: __________ Self-Rating: _____ Teacher Rating: ________
# Classroom Engagement Rubric

For each row, check the descriptor that best matches your work or classroom behavior.

<table>
<thead>
<tr>
<th>Quality of Work</th>
<th>Exemplary</th>
<th>At Standard</th>
<th>In Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Produces timely, high-quality work; consciously meets or exceeds standards</td>
<td>Completes work on time; meets standards established for assignments</td>
<td>Turns in insufficient or incomplete work</td>
</tr>
<tr>
<td></td>
<td>Uses language of discipline frequently and comfortably</td>
<td>Uses language of discipline when instructed</td>
<td>Does not use language of discipline</td>
</tr>
<tr>
<td></td>
<td>Self-motivated—takes an active, inquisitive role in learning</td>
<td>Takes responsibility for work and grades</td>
<td>Avoids responsibility for work and grades</td>
</tr>
<tr>
<td></td>
<td>Work is original</td>
<td>Work is good replica of teacher’s model</td>
<td>Work lacks structure or organization</td>
</tr>
<tr>
<td>Class Participation</td>
<td>Asks questions to extend the discussion, and clarifies when needed</td>
<td>Asks questions to clarify instruction and information when needed</td>
<td>Does not ask questions when needed</td>
</tr>
<tr>
<td></td>
<td>Consistently offers point of view, and is open to the views of others</td>
<td>Answers questions and participates when called upon; respects the views of others</td>
<td>Rarely participates in any way</td>
</tr>
<tr>
<td></td>
<td>Uses class time well—uses classroom resources</td>
<td>Uses class time well; stays on task</td>
<td>Does not use class time well</td>
</tr>
<tr>
<td>Group Work/Behavior</td>
<td>Consistently in class—does not fall behind as a result of absences</td>
<td>Consistently in class; catches up when absent</td>
<td>Truancies, tardies, and/or absences are a problem; falls behind in work</td>
</tr>
<tr>
<td></td>
<td>Helps others learn</td>
<td>Does not disrupt others in class</td>
<td>Disrupts class</td>
</tr>
<tr>
<td></td>
<td>Takes excellent notes in class</td>
<td>Takes useful notes in class</td>
<td>Takes useless notes or no notes</td>
</tr>
<tr>
<td></td>
<td>Takes leadership role in group work</td>
<td>Is a positive, productive group member</td>
<td>Does not contribute to group work; whines and complains; sleeps in class</td>
</tr>
</tbody>
</table>
Reflective Moment: Metacognition

- Scientists tend to be devoted to the areas they study. Why would some degree of passion or devotion be necessary to the recovery of the black-footed ferret?...What happens when passion gets in the way of seeing all perspectives on the problem?
Reflective Moment: Thinking about Systems

• What are some negative consequences of an unbalanced system? What are some possible consequences of having the system go out of balance?
Assessments for Different Lessons

• Problem Engagement

• Inquiry and Investigation
  — Research
  — Genetic Bottleneck
  — Analysis/Synthesis

• Notes Page
• Reflection
• Research Notes
• ‘Top 5 Facts’
• Experimental Design
• Data Chart
• Graphic Organizer
Organic and Authentic
Engaging for ALL

Differentiated for the Gifted

Habitats
Biomes
Endangered Species
Research
Communication

Metacognitive Reflection
Advanced Conceptual Reasoning
Long Range Thinking
Intended and Unintended Consequences
Interdisciplinary Understanding
Efficacy

PubMed Listed

425 articles on PBL

in 2012

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128 already in

2013
Content Acquisition

• Short term acquisition significantly lower but levels out over time (MC tests)

• Short term acquisition is no different, or better than, traditional instruction (medical boards, high school studies, clinical reasoning)

• Adding lectures does not increase student achievement in PBL (Van Berkel & Schmidt, 2005)
Content Acquisition in Problem-Based Learning: Depth versus Breadth in American Studies
Gallagher & Stepient, 1997

• 167 Gifted Students
• Traditional or PBL Post-Hole Classroom
• Standardized test Pre- and Post-
• PBL Students Significantly Higher
Group Work

• 80% of time on task and productive (Visschers-Pleijers, et al., 2004)

• Students in PBL tutorials more engaged than students in other collaborative groups (Wun et al., 2007)

• Increasing self-regulation leads to increased mutual reliance, critical thinking and concept formation (Cooper, et al., 2008)

• Student achievement is higher in effective PBL groups (Van den Hurk, 2006)
Student Satisfaction

“...no sample was found in which the students’ attitudes did not favor PBL to some degree.”

Vernon & Blake, 1993, p. 554

- Enjoyment from their learning
- A more meaningful learning environment
- More nurturance
- More and better student-to-student interactions
- Stimulation of a greater breadth of interest in subject
Dysfunctional Classes: The Problem

- Unprepared
- Non-participation
- Conflicts between students because of unclear expectations
- Present information that is unrelated to the problem
- Unproductive class discussions
- *Emphasis on research instead of thinking about the problem*
Using Problem-based Learning to Explore Unseen Academic Potential

http://docs.lib.purdue.edu/ijpbl/vol7/iss1/9

<table>
<thead>
<tr>
<th>Variable</th>
<th>TI vs. GE</th>
<th></th>
<th></th>
<th>TI vs. AAP</th>
<th></th>
<th></th>
<th>GE vs. AAP</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>d</td>
<td>Mean</td>
<td>SD</td>
<td>d</td>
<td>Mean</td>
<td>SD</td>
<td>d</td>
</tr>
<tr>
<td>End of Grade English</td>
<td>5.55***</td>
<td>1.49</td>
<td>0.79</td>
<td>3.64*</td>
<td>1.72</td>
<td>0.52</td>
<td>-1.91</td>
<td>0.99</td>
<td>0.27</td>
</tr>
<tr>
<td>End of Grade Math</td>
<td>3.10</td>
<td>1.45</td>
<td>0.38</td>
<td>1.93</td>
<td>1.68</td>
<td>0.24</td>
<td>-1.17</td>
<td>0.96</td>
<td>0.14</td>
</tr>
<tr>
<td>Insights PBL Understanding</td>
<td>1.46*</td>
<td>0.58</td>
<td>0.61</td>
<td>0.90</td>
<td>0.65</td>
<td>0.38</td>
<td>-0.56</td>
<td>0.37</td>
<td>0.23</td>
</tr>
<tr>
<td>Insights Science</td>
<td>0.61</td>
<td>0.64</td>
<td>0.25</td>
<td>-0.65</td>
<td>0.74</td>
<td>0.26</td>
<td>-1.26**</td>
<td>0.44</td>
<td>0.51</td>
</tr>
<tr>
<td>Insights Social Studies</td>
<td>0.84</td>
<td>0.53</td>
<td>0.36</td>
<td>0.08</td>
<td>0.6</td>
<td>0.03</td>
<td>-0.76*</td>
<td>0.34</td>
<td>0.32</td>
</tr>
<tr>
<td>Insights Teacher Ratings</td>
<td>0.02</td>
<td>0.25</td>
<td>0.01</td>
<td>-1.21***</td>
<td>0.28</td>
<td>1.11</td>
<td>1.22***</td>
<td>0.16</td>
<td>1.12</td>
</tr>
</tbody>
</table>

Table 7. Adjusted pairwise mean differences obtained from generalized linear model with classroom as dummy variable. Note: Negative values indicate direction and favor AAP students in all instances. Positive values in TI vs. GE comparison favor TI students.
Students: Problem-Solving

• Helped me realize how we solve problems today in the adult world. I learned that not everything can be fixed with duct tape.

• It actually challenged us to think and solve problems.

Horak & Pryde-Haskins, 2012
Students Self-Directed Learning

- It was fun to be able to have control of a solution and think for myself. Learning about the human side of it all helped me think deeply.

- You don’t feel like you are learning but you are, you also remember the important parts better than by just studying. We didn’t have to purposely memorize everything we learned but soaked up the information so we could solve the problem.

Horak & Pryde-Haskins, 2012
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Horak & Pryde-Haskins, 2012
Students: Authentic Learning

• This was **something real** people are working on and some of us got pretty passionate about it.

• Gave us a modern, real-life topic, allowed us to find **realistic solutions** that could **make a difference**.

• It was an **actual problem** to solve. You couldn’t just turn on the computer and find the answer.

Horak & Pryde-Haskins, 2012
Teachers

• I can't even imagine doing this without the training. I was scared to death to do this and I had the training twice.

• I've been afraid of this unit for a long time, once I did it and saw you can tie in the content and you can make it fit because you don't need to spend that much time teaching.

• Overall, we were pretty pleased with how the unit went, I think even more so after we read our students’ comments.
Have Musicians and Composers
What you have been obliged to discover by yourself leaves a path in your mind which you can use again when the need arises.

G. C. Lichtenberg