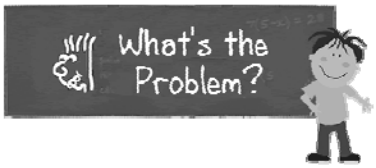
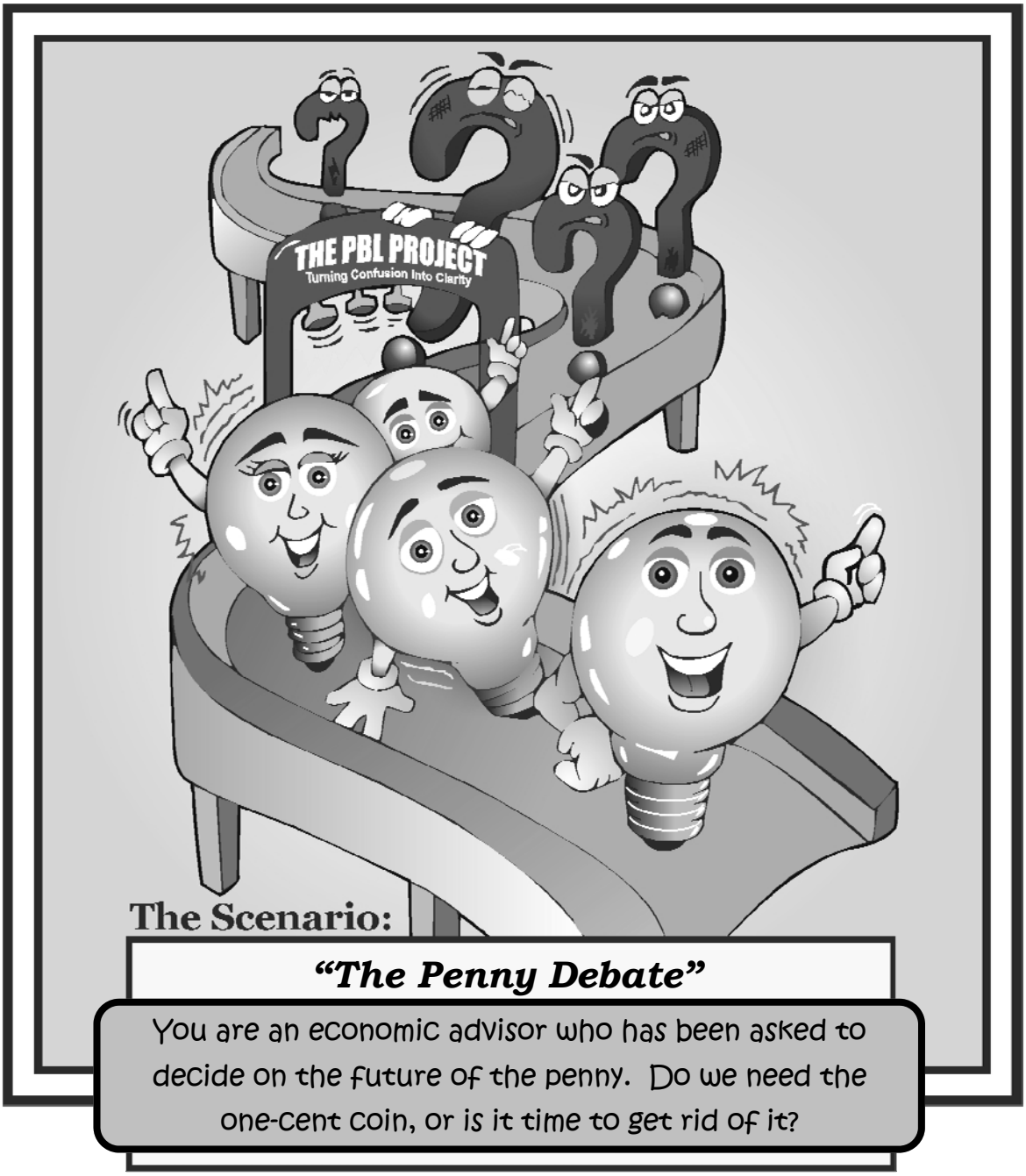
THE PBL PROJECT

Problem-Based Learning. Done Right. Finally.



Integrated Problem Scenarios
Middle School / Secondary



*** Features engaging and real-world scenarios**
*** Integrates all core subjects**
*** Includes all teacher and student resources**
*** Provides a full overview of Problem-Based Learning**

PBL Project

Integrated Problem Scenarios

Every effort has been made to make this book as complete and accurate as possible. However, *there may be mistakes*, both typographical and in content. Therefore, this material should be used only as a guide and not as an ultimate source of research. Homecourt Publishers shall have neither the liability nor responsibility to any person or entity with respect to any loss or damage caused by the information contained in this book.

Throughout this book, students are asked to refer to "Stimulus Items." These are outside sources that have been collected to help students gain knowledge about the Problem Scenarios. These sources may have been edited or adapted at times due to length, format, or readability, and they don't necessarily reflect the personal opinions of the editors. Every effort has been made to credit these resources by providing appropriate source information.

*Okay, now that you've got all of the disclaimers out of the way—**go have fun!!!***

For information or comments, contact:

Homecourt Publishers
2435 East North St., #245
Greenville, SC 29615-1442

ben@pblproject.com
www.pblproject.com
(864) 877-5123

Managing Editor - **Ben Bache benbache@homecourtpublishers.com**

Cover illustration by **Denis Proulx**.

A Note to the Teacher:

If there was something about the cover or title of this book that interested you enough to pick it up and turn to this page, then you probably already know what we are going to say. The truth is that, in today's world, students must leave the classroom equipped with 21st century skills and ready to meet the challenges of real life. One of the best ways to meet these demands is through interdisciplinary **Problem-Based Learning** scenarios. This type of classroom instruction promotes communication, collaboration, curiosity, organization, and problem-solving skills . . . all major components of any reputable set of standards.

The Problem-Based scenarios in this book integrate Language Arts, Math, Social Studies, Science, and other content areas. They offer educators a chance to shift the work of learning from the teacher to the students, where it belongs. If we wish to prepare a generation of students to solve real-world problems, we simply must give them real-world problems to solve… Problem-Based Learning is the way to accomplish this task.

So, let's get ready to begin! Enjoy,

Your Friendly Editors

Table of Contents

What's in a name?

A Fair Question:

What's the difference between "Problem-Based Learning" and all of these other terms?

- Case-Based Learning
- Challenge-Based Learning
- Design-Based Learning
- Inquiry-Based Learning
- Project-Based Learning
- Team-Based Learning
- Passion-Based Learning
- Work-Based Learning

The Answer:

Nothing… if they are done right.

Each of the terms listed above describes a scenario where students must make choices about a situation based on the information they are given. That's what Problem-Based Learning is all about!

We prefer the term "Problem" because it highlights the thinking element of the process.

By contrast, consider the term "Project-Based Learning." While the process is the same, the word "Project" brings to mind a simple assignment that must be completed in the same way you follow a recipe.

(the word "project" brings to mind a volcano made from baking soda and vinegar)

So, what exactly is "Problem-Based Learning"

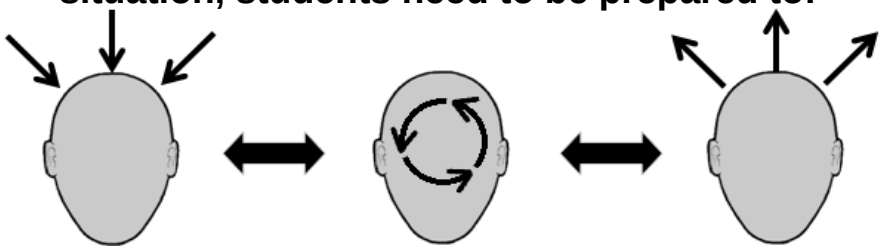
If you're looking for a scholarly academic definition for Problem-Based Learning, this one will do as good as any:

> Problem-Based Learning is an instructional method that challenges students to "learn to learn." It prepares students to think critically and analytically, to work cooperatively with others and with technology, and to find and use appropriate learning resources.

Yes, that's quite a mouthful! The good news is that instead of viewing Problem-Based Learning as a definition, it's better to understand it as a **process**. Here's what we mean:

The 1-2-3 of Problem-Based Learning

When faced with any problem, challenge, or situation, students need to be prepared to:



Step 1	Step 2	Step 3
Absorb the information	**Evaluate the information**	**Generate the response**
Sort through the "stimulus" (articles, videos, discussions, statistics, etc.) that deal with that situation	*Recognize relevant details and organize thoughts based on the "evidence" provided through the surplus of information*	*Generate a logical "response" (design a proposal, form an argument, create a plan-of-action, etc.) based on the evidence*

Now: Wash. Rinse. Repeat.

Students must work through the process multiple times with different scenarios in order to become comfortable with each step.

Why Problem-Based Learning?

The only clear and rational answer to, *"Why Problem-Based Based Learning?"* is to say that "*Students need it.*" Simply memorizing facts, definitions, or mathematical formulas does not equip a student to thrive in today's world. This shift is highlighted by a few recent developments.

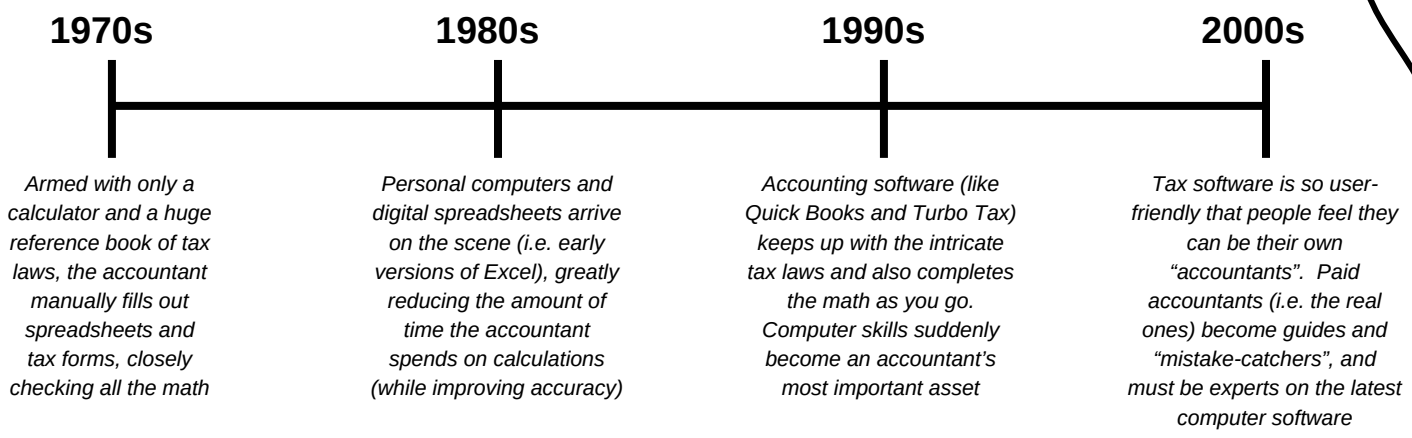
First, new academic standards (including the Common Core) that are being developed around the country are often centered around a simple mantra:

"College and Career Ready"

It seems obvious, but there's a trick. "College and Career Ready" is a moving target. Consider a student who is in upper elementary school right now (ages 8 to 10). There is no telling what career he or she will have twenty years from now, at around 30 years of age. There is a long list of jobs that didn't exist even 10 years ago *(**app designer, social media manager, Zumba teacher**… just to name a few).* There are certainly many career paths that don't exist now that will be common in a couple of decades *(perhaps a **virtual reality tour guide, body part replacement specialist, or weather modifier***). Likewise, there are jobs that are familiar at the moment that may be on their way out *(watch out **retail cashiers**)*.

To try and predict the specific knowledge base and skill set that students will need for their future careers may be like an old-timer placing his music CDs into a time capsule just so he can have a good laugh twenty years later. To really drive home the point, consider a "predictable" job that has existed for hundreds of years, and will certainly exist for hundreds more. I'm referring to the trustworthy **accountant** (and for this exercise, we'll just look at the "tax preparation" part of the accountant's job, because taxes aren't going anywhere!). Let's see how this job has changed:

The Evolution of an Accountant *(during tax season)*



So, the skill set has changed and the accountant has gone from a quiet, detail-obsessed math guru to a software expert who is willing to empower the customers to do a job that once only he or she could do. And every job is going through similar transitions. One of the main reasons for this development is technology, which brings us to the question raised on the next page.

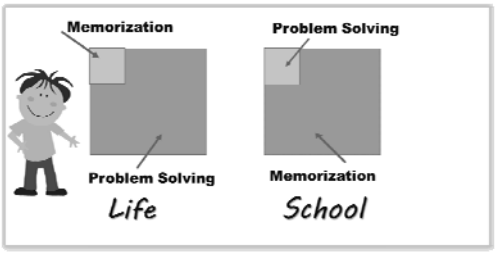
And what about technology?

Here's something to think about: ***What do you teach a student who has access to all of the information in the world?***

It's a fair question. You'd be hard-pressed to find a fact, statistic, quotation, formula, or tiny detail that your average 5th grader can't find in less than a minute with a Smart Phone (or, coming soon, wearable technology). If they are armed with the right technology, students will react like so:

- *"Who wrote Uncle Tom's Cabin?"* - **"No problem."**
- *"What is the formula to find the volume of a rectangular prism?"* - **"Piece of cake."**
- *"What is the diet of the duck-billed platypus?"* - **"Coming right up."**

Consider this visual:



Technology is a game changer. The above illustration shows a trend that has been true for quite some time, and the age of "instant information" only makes life's "Memorization" square smaller.

Yes, there is baseline knowledge every student should have. For example: *Should elementary school students be able to name the first president of the United States?* Of course. *Should middle school students be able to graph a simple formula?* Absolutely.

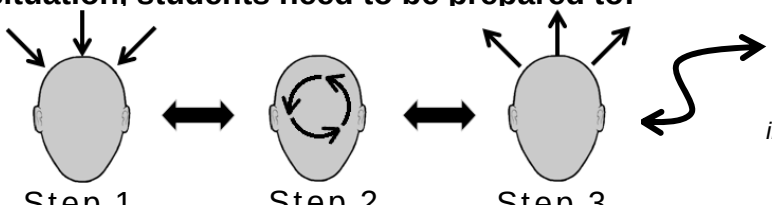
The issue is that the amount of information that is labeled "absolutely must memorize" keeps shrinking and, frankly, gets less critical to a student's success. For example: *Should students instantly know the capital of Alabama?* It's hard to say. After all, it's only a click away.

So, we've established that what students need to know is changing. That leaves one question...

Well, what do they need to know?

We hate to be repetitive (not really), but **it all comes back to the skills of Problem-Based Learning.** These skills will be vital to students regardless of the inevitable changes that the future brings.

When faced with any problem, challenge, or situation, students need to be prepared to:



Step 1
Absorb the information

Step 2
Evaluate the information

Step 3
Generate the response

The age of "instant information" may create a shift in classroom instruction, but it should be embraced by teachers and students. What is important to remember is that absorbing the information (Step 1) is just a small part of the process. In fact, technology can also be used to approach the other steps in unique ways (especially the way the student can respond in 'Step 3')

What are the key features?

When carried out correctly, a classroom that revolves around Problem-Based Learning has a flow and level of engagement that is hard to match with any lesson that begins with *"turn to page 17 in your textbook."* Listed below are characteristics that you'll notice in a class that is working on a Problem-Based Scenario like the one offered in this book:

The PBL Checklist

- ☑ Students focus on content that is relevant to them in **real-world scenarios**
- ☑ The **teacher serves as the mediator,** and **students are in charge** of managing, planning, and executing the task
- ☑ Students demonstrate **21st Century Skills** (collaborating, researching, communicating, etc.)
- ☑ Instead of a single answer, students consider **multiple points-of-view**, and search for **evidence to support their views**
- ☑ Knowledge, skills, and information **integrates across multiple subjects**
- ☑ **Students respond in a variety of ways**, creating "products" that go beyond writing an answer to a single question

What are misconceptions?

The term "Problem-Based Learning" (along with any of the related ones on page 6) is often used out of context or with no clear idea in mind. As a result, both critics and supporters of the strategy commonly identify PBL with characteristics that simply aren't true. Here are some common misconceptions we've run across:

Misconceptions of Problem-Based Learning

The misconception: **"There is no wrong answer."**

The truth: ***A Problem-Based Scenario will not have a single, "correct" answer. However, a response that is not logical and where no effort has been made to support it is a "wrong" answer.***

The misconception: **"Problem-Based Learning is just the hot topic that is currently gaining momentum (i.e. it's a fad)."**

The truth: ***Problem-Based Learning has been around for generations, and will be around for many more. It is becoming more essential in a world where facts are instant and effortless, making "thinking" a powerful skill.***

The misconception: **"Problem-Based Learning isn't about 'facts'."**

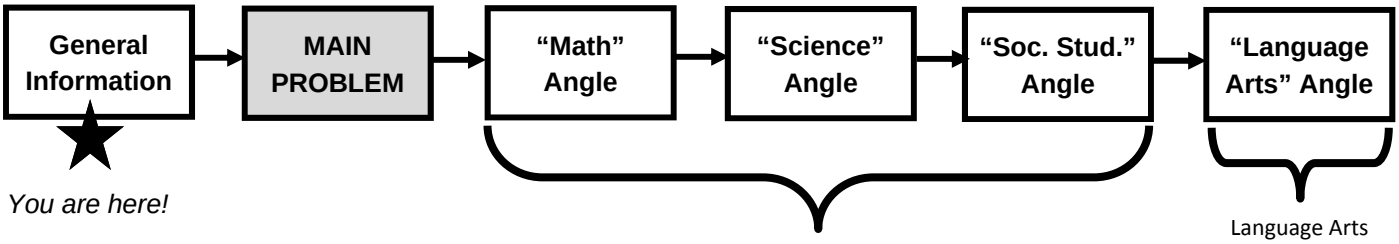
The truth: ***You always have to have the facts right. However, in today's world, finding facts on any topic is usually just a click away. It's what you do with those facts that matters—that's Problem-Based Learning.***

The misconception: **"The learning really begins when students are given a problem they've never considered before."**

The truth: ***There are few things in life that aren't a "problem" (What should I buy at the store? Where should we go on vacation? What can we do this weekend?). The skills of Problem-Based Learning can be developed with all of these.***

How does this book work?

This book is divided into several sections, listed below in the order in which they will appear:



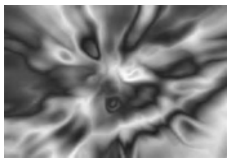
You are here!

We will look at the Main Problem from several points-of-view, each conveniently divided into a core subject area.

Language Arts serves as the "hub," where students will use all points-of-view to provide a comprehensive response to the Main Problem.

This "subject angle" format works well because the goal is to simulate a real-world scenario within a school setting. As the illustration below suggests, they do not always replicate one another:

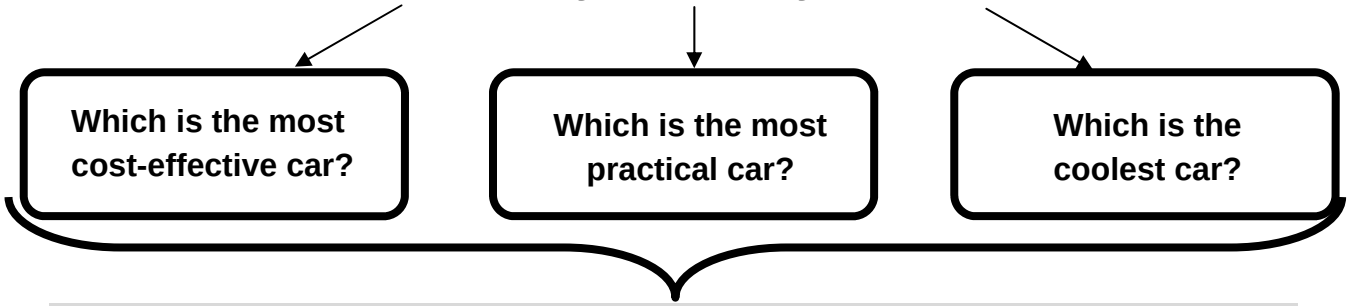
School = 

Life = 

Think of it like this…

This is your MAIN PROBLEM SCENARIO

You need to buy a new car. Which car is the best fit for you and your situation?



These are the different perspectives from which it's necessary to approach the Main Problem. In our scenario, these perspectives will all fit nicely into a core subject area and are referred to as the "subject angles."

So, which car are you going to buy?

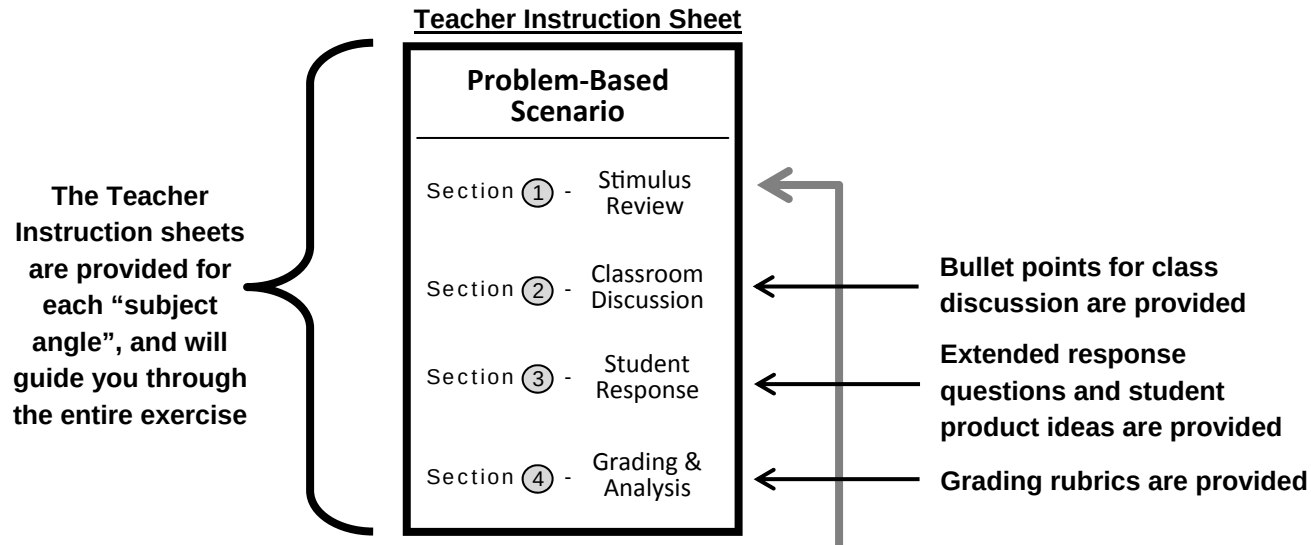
In the end, the different perspectives must be evaluated to provide a single response to the Main Problem. In our exercise, this comprehensive answer is provided in the Language Arts section.

What is provided?

The short answer is "everything you need!"

As you work through the Problem-Based Scenario in this book, both you and your students will be provided with the necessary resources each step of the way.

Teacher Resources



Student Resources

- **Stimulus Items *(articles, videos, infographics, statistics, etc.)* are all provided for each exercise**
- **"Thought-Gathering" sheets are provided to help students organize their ideas**
- **Handouts are provided to introduce and layout the instructions for all steps of each exercise**

Remember, a unique set of all of these resources will be provided for each "subject angle"

Standard Alignment

How many times have you reviewed a new resource and asked, *"How does this align to* **my** *standards?"* It's certainly a fair question, especially considering how teachers themselves are assessed and how their performances are monitored.

What's interesting is how teachers like to refer to them as "my standards." Often times, an obsession over a specific set of standards—whether it is a set of state standards or even the Common Core—can result in extremely qualified educators missing a few simple steps. The most important of those steps may be to define what exactly is meant by the term "standards."

For our purposes, we'll simply say that "standards" are a written description of what a student should know and what he or she should be able to do related to a specific subject area. A clear set of standards will even tell how well students should know it and well they should be able to do it.

From that broad perspective, standards really don't differ too much around the country. You can argue the subtleties all day, and yes some standards are certainly clearer and more logical than others. Still, everyone agrees that by the time a student finishes 1st grade, he or she should know the differences between the four seasons… and a 4th grader should not only know the name of our first president, but also understand why our founders were so adamant about checks and balances… and a student should finish elementary school with a firm grasp of all four mathematical operations. You get the point.

Of course, a great set of standards will make these milestones very clear and help a teacher accomplish the goals without missing any steps along the way. We certainly hope that the problem scenario in this book will be helpful in that quest.

As you go through this book, each "subject angle" will provide specific learning goals based on the topics that fit the exercise. In most cases, students will achieve the goals simply by working through the exercise. In other cases, they will have to be "led there" with a little help from the teacher.

However, it's important to note that Problem-Based Learning isn't about absorbing names, dates, facts, and figures. A textbook is still great for that. The next page will outline several "hidden learning goals" that are extremely important, and that a textbook just won't touch.

The concept of Higher-Level Thinking is certainly nothing new, and a number of "educational scholars" have worked hard to define and classify the concept. We're not going to try to invent the wheel here. Instead, we're going to use the work of the experts to show how vital Problem-Based Learning is to a student's education:

Webb's Depth of Knowledge

(the very abbreviated version)

DOK 1	- recalling information, citing evidence, following simple instructions	**Demonstrated as students review various stimulus items**
DOK 2	- understanding and explaining concepts, which can lead to sound predictions and interpretations	**Demonstrated during class discussion and the "thought-gathering" phase**
DOK 3	- using information and concepts to make broad connections and interpret and support abstract ideas	**Demonstrated as students answer the Extended Response questions**
DOK 4	- applying ideas and concepts in a different situation, creating something new with information	**Demonstrated as students create their "Products" for each exercise**

21st Century Skills

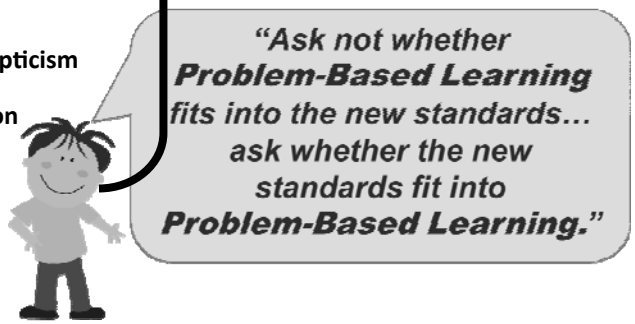
- **Critical Thinking**
- **Researching**
- **Creativity**
- **Planning**
- **Communication**
- **Collaboration**
- **Leadership**
- **Technological Ability**
- **Social Awareness**
- **Scientific Literacy**
- **Entrepreneurialism**
- **Flexibility / Adaptability**
- **Internet / Media Literacy**
- **Data Analysis**
- **Personal Expression**

Life Habits

- **Patience**
- **Perseverance**
- **Imagination**
- **Leadership**
- **Healthy Skepticism**
- **Self-Direction**

Throughout a student's education, he or she must develop skills and lifelong habits in order to succeed.

It is in the development of these abilities and traits that traditional teaching methods often fall short, and where Problem-Based Learning greatly succeeds.



When considering standard-alignment, it is the development of skills and habits that is the greatest benefit of PBL!

The Main Problem:

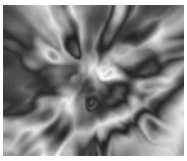
Here is the Problem-Based Learning scenario that is the focus of this guide:

You are an economic advisor who has been asked to make a recommendation about the future of the penny. The one-cent coin is the smallest currency we have in circulation (and what you can buy with it goes down every year). It has been argued that it's time to get rid of the penny, while others feel that choice would have a negative impact. What is the correct course of action?

Of course, every significant challenge in life needs to be looked at from several points-of-view. For the Problem-Based Scenario in this book, the different "points-of-view" have been divided into a math angle, a science angle, and a social studies angle. Then, in Language Arts, all points-of-view are evaluated into a single approach.

Obviously, life isn't so cleanly divided into subject areas. Remember the visual that you saw on page 12:

School



Life

It's certainly a challenge—impossible, actually— to have "real life" crunched into a box that fits the academic schedule. Still, having students review a problem from several angles (even if they are neatly divided along subject lines) helps them understand that problems are multi-dimensional, made up of pieces so complex that they must be evaluated on their own. Only after all of the pieces have been individually examined can the problem be properly approached as a whole.

So, each "subject angle" is one piece of the puzzle. That's not to say they aren't plenty challenging in their own right. In fact, they are wonderful exercises for math, or science, or social studies class, even if you never have a chance to get into the other subject points-of-view.

Now we're ready to begin. The page to the right outlines the "subject angles" that we've created for the Problem-Based Scenario in this book.

The "Subject Angles":

In order to properly respond to the Main Problem, it is important to consider multiple points-of-view. Below are several angles from which to approach the problem.

The Math Angle:

Does the penny cost more than it's worth?

Students will review the true cost of producing a penny and compare that with its monetary value, and decide whether it makes economic sense.

The Science Angle:

What materials and resources are used in the process of making the penny?

Students will review the science involved in the making of the penny, as well as the natural resources needed, and determine if that should be factored into the decision about whether to continue minting the coin.

The Social Studies Angle:

Does the penny serve an important economic purpose in our monetary system?

Students will review the economic role of the penny, and also how the public views the coin in general, and decide on the value of the coin from that perspective.

★ **Language Arts** serves as the hub for the entire exercise. It is in ELA that all of the other "subject angles" are evaluated and measured against one another, and a final decision about how to approach the Main Problem Scenario is made based on all of the available information.

A Note to Parents

Of course parents like to be kept in the loop, so they will appreciate a note home to tell them about the Problem-Based Learning and the specific scenario you will be working on with your students. But there's another reason (perhaps a bit more sneaky) why we like to send the letter home. It helps set a tone for the entire exercise, prompting students to approach it with respect and a level of seriousness. It is safe to say that when you send the "letter home", you mean business.

We've written a sample letter below that can be a model for your Parent Letter. Obviously, you can add your own spin on it as you wish:

Dear Parents,

Our class is preparing to engage in a Problem-Based Learning exercise. The term "Problem-Based Learning" (or PBL) is being used more frequently in education, and I just want to take a moment to explain what we will be doing and what the goals are.

First, it's an important part of an educator's job to make sure students leave the classroom ready for the challenges of life and equipped with 21st century skills (i.e. skills that focus on communication, organization, technology, and problem-solving). We use these skills every day. Unfortunately, they are often overlooked as students work to absorb names and dates, facts and figures.

For example, let's say you have to go to the bank in the afternoon. In school, we may have a lesson on map reading and ask the students to find the best route to the bank. Of course, that's an incomplete look at the challenge of actually going to the bank. In real life, getting directions to the bank is the easy part. To make it a successful outing, you will also ask yourself:

- *What time do I need to go? What are the banking hours? What will traffic be like?*
- *Why am I going? What do I need to bring? Is this a drive-through visit or do I need to go inside?*
- *What else do I need to do this afternoon? How will my bank visit work into my overall schedule?*

And so on… The ability to answer (and know enough to ask) these questions and respond accordingly enables you to use your time and resources in the best way (even with something as simple as going to the bank) . Students need to learn to do the same. Allowing students to work through Problem-Based Learning scenarios will help them develop the skills that go beyond simple memorization.

For our problem-base scenario, we are going to fast-forward to the day when the students are working citizens, and they will have to address a real problem that has no easy answer. Here's the specific task:

You are an economic advisor who has been asked to make a recommendation about the future of the penny. The one-cent coin is the smallest currency we have in circulation (and what you can buy with it goes down every year). It has been argued that it's time to get rid of the penny, while others feel that choice would have a negative impact. What is the correct course of action?

Obviously, this is not a "yes or no" problem. To come up with a logical approach, students will review different "stimulus items" related to the topic (articles, videos, statistics, infographics, etc.), engage in classroom discussion, and organize their thoughts as they absorb information. They will look at the problem scenario from several points-of-view across multiple subject areas. Next, they will work in groups to come up with the best approach to problem, and they will present their findings in a simulated "real-life" situation. It will be challenging, but very enjoyable and it will ultimately result in a tremendous sense of accomplishment. Best of all, this exercise will help develop a wide variety of skills that students will use the rest of their lives!

Your Friendly Teacher

The Intro to Students

This is the fun part! The success of this exercise greatly depends on the excitement and engagement of the students. As you know, it's best if you can hook them right from the start. We took this into consideration when creating this Problem-Based Scenario, and these are points that might be worthwhile to stress when introducing the Main Problem:

1. **First Person** — *your students are main players in the problem… they are not solving an abstract problem for someone else*
2. **Real-World** — *the problem scenario is a real-life situation… this makes it more relevant and increases engagement*
3. **Sense of Urgency** — *simple phrases like "you must" and "it is important to" help add a sense of urgency*
4. **Short and Sweet** — *limit the introduction of the problem scenario to a few sentences… the details will be ironed out later*

The Main Problem

1 *The students are participants in the problem, so they will be approaching it from a **first-person** perspective*

> You are an economic advisor who has been asked to make a recommendation about the future of the penny. The one-cent coin is the smallest currency we have in circulation (and what you can buy with it goes down every year). It has been argued that it's time to get rid of the penny, while others feel that choice would have a negative impact. What is the correct course of action?

2 *This scenario is a very **real-world** problem that is being discussed in today's world. Students most likely have a previous awareness of the issue, or they should become aware of it. Either way, it makes the exercise more engaging.*

3 *By definition, a problem should have a **sense of urgency** (otherwise, it's not a problem at all). The wording of the Main Problem was chosen to stress that it is something that must be addressed. Students will become more engaged if they, too, feel the pressure of the situation.*

4 *As students work through the problem, they will be exposed to many details and related resources. For the introduction, though, it's best to keep it **"short and sweet"** as shown above. This not only grabs students' attention, but it actually makes it easier to understand the final goal of the problem scenario.*

Section 2:

"The Math Angle"

Teacher Instruction Sheet

The Main Problem Scenario:

You are an economic advisor who has been asked to decide on the future of the penny. Do we need the one-cent coin, or is it time to get rid of it?

The "Math Angle":

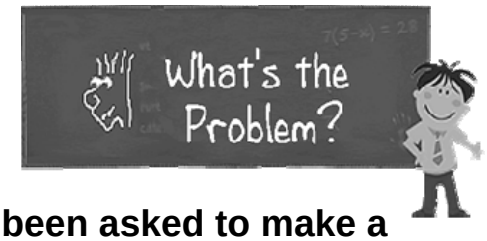
Does the penny cost more than it's worth?

The MATH ANGLE

*Your **Teacher Instruction** page is shown to the right. A unique Teacher Instructions sheet is created for each "subject angle" of the Main Problem Scenario, and walks through the entire process of viewing the problem from that point-of-view. Everything that is referenced in the Teacher Instructions (student stimulus items, classroom discussion sheets, thought-gathering sheets, rubrics) will be provided as you work through the exercise.*

Make a photocopy of the Teacher Instructions to walk you through the entire "math angle"

Teacher Instructions:



"The Penny Debate"

Problem Scenario: **You are an economic advisor who has been asked to make a recommendation about the future of the penny. The one-cent coin is the smallest currency we have in circulation (and what you can buy with it goes down every year). It has been argued that it's time to get rid of the penny, while others feel that choice would have a negative impact. What is the correct course of action?**

Your students will be viewing this problem from an **MATH** perspective.

Does the penny cost more than it's worth?

Students will review the true cost of producing a penny and compare that with its monetary value, and decide whether it makes economic sense.

Step 1
Review Stimulus Items

Stimulus Item #1 — "What does a penny cost?" (video)

Stimulus Item #2 — "Value of a Penny" (statistics)

Stimulus Item #3— "Making U.S. Currency" (infographic)

***Students should take notes as they review the Stimulus Items*

Step 2
Classroom Discussion

Lead a **class discussion** about issues related to the topic.
You are being provided a sheet to help you guide the classroom discussion.

Extended Response: Have students answer the following questions. Remind students to use information from the Stimulus Items to support their response.

1) **It can easily be seen that it costs more than one-cent to mint a one-cent penny. However, what other mathematical calculations are needed to truly figure the "cost" of the penny compared to its value?**
2) **Based on mathematical factors (as opposed to personal feelings or tradition), does it make sense to get rid of the penny? Why or why not?**

Step 3
Student Response

****students should have access to their notes as they enter their answers*

****students may also have access to the Stimulus Items as they enter their answers*

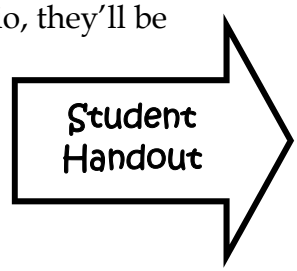
Product Option: Divide students into small groups, who will serve as **economic advisors** to the United States government. Each group is responsible for **preparing an oral and visual presentation** to a Senate Committee that is trying to decide whether or not to get rid of the one-cent penny. The committee has asked the advisors to answer one question: *"What is the true value of the penny compared to its true cost to mint?"* The groups must help the committee understand that calculating "true value" and "true cost" can be complicated when you consider factors such as fixed costs in the minting process (i.e. the costs to run and manage the minting factory regardless of which type of coins are being minted), the lifespan of the penny, and the amount of times it is used over that lifespan. Based on the numbers and their best estimates, groups will then give their recommendation as to whether to include or remove the penny from our from our monetary system.

Step 4
Analysis

Rubrics to grade student entries have been provided, and all questions have been mapped to the content standards.

Math Standards

As students work through this section of our Problem-Based Scenario, they'll be focusing on several mathematical content areas. This includes:



- **Data Analysis**
- **The Number System**

In addition—and perhaps more importantly—students will need to take on a mathematical frame of mind (in academic circles, this is referred to as the "Standards for Mathematical Practice"), which is a key benefit of Problem-Based Learning. This means that students will need to:

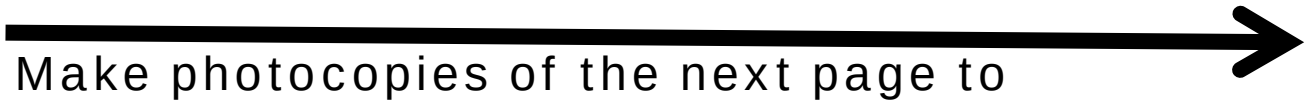
- **Make sense of problems and persevere in solving them.**
- **Reason abstractly and quantitatively.**
- **Construct viable arguments and critique the reasoning of others.**

The MATH ANGLE

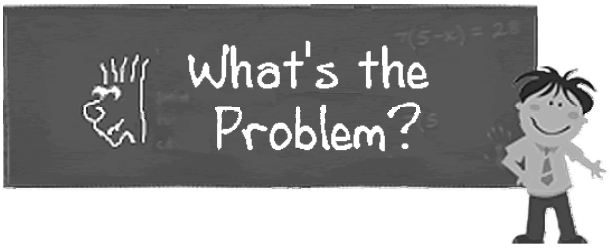
You may want to share the goals listed above with your students prior to beginning the exercise, but the best part is that they'll be developing these skills whether they realize it or not!

The most important thing to remember when introducing the Problem-Based Scenario is to grab student interest right away. It is a fun and challenging exercise, and you certainly want students to approach it that way.

To make this easy for you, we have created a handout to introduce the "math angle" to your students for this Problem-Based Scenario. This will help them see that they will be looking at the Main Problem Scenario from a specific point-of-view, in this case with a mathematical focus.



Make photocopies of the next page to introduce the "Math Angle" of this Problem-Scenario to your students



Are you ready to tackle the problem?

The Scenario:

You are an economic advisor who has been asked to make a recommendation about the future of the penny. The one-cent coin is the smallest currency we have in circulation (and what you can buy with it goes down every year). It has been argued that it's time to get rid of the penny, while others feel that choice would have a negative impact. What is the correct course of action?

In order to properly respond to a complicated problem like the one above, you must view it from different points-of-view. In this case, we will consider the following:

Something to think about:

Does the penny cost more than it's worth?

Prior to giving your response, you will review multiple resources, engage in classroom discussion, and take time to organize your thoughts.

In this exercise, you will review the true cost of producing a penny and compare that with its monetary value, and decide whether it makes economic sense.

★ *As you work on this exercise, remember that this is primarily a **mathematics question**. This means that numbers, statistics, and calculations will be needed to support your ideas!*

Teacher Instruction Sheet

Problem-Based Scenario

Section 1 - Stimulus Review

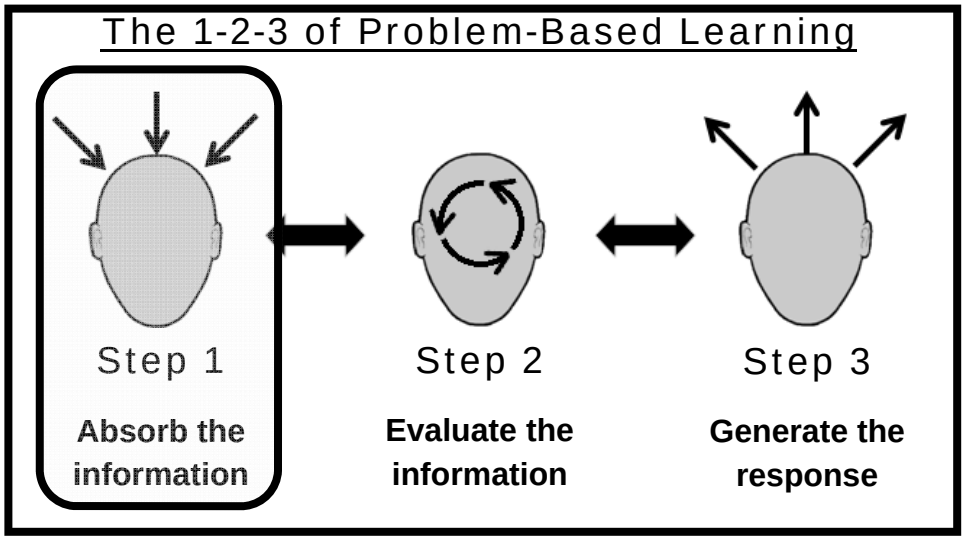
Section 2 - Classroom Discussion

Section 3 - Student Response

Section 4 - Grading & Analysis

Stimulus Review

The Stimulus Review is Section 1 *on your* ***Teacher Instruction Sheet.***



The MATH ANGLE

It's a fancy term, but the "Stimulus Review" is simply the first step in Problem-Based Learning where students review a variety of information surrounding the specific problem or challenge.

In our Problem Scenario, all of the Stimulus Items have been provided for you. We have intentionally gathered a variety of different types and sources. This is important in today's modern world where information comes from all directions, and also sets the stage for Step 2 (Evaluating the Information).

A few examples of the types of Stimulus Items you might see in a Problem-Based Scenario include:

- **Articles**
- **Videos**
- **Infographics**
- **Blogs**
- **Statistics**
- **Lists**
- **Websites**
- **Editorials**
- **Audio Recordings**
- **Cartoons**
- **Primary Sources**
- **Advertisements**

…and much more!

For your convenience, we've placed all of the Stimulus Items for this Problem-Based Scenario on a special website where **both you and your students** can have full access to them. To access these resources, you will go to:

http://www.pblproject.com/students

Login: **penny**
Password: **eb96**

The Stimulus Items you'll see for this section of the exercise include:

Stimulus Item #1

— "What does a penny cost?" (video)

Stimulus Item #2

— "Value of a Penny" (statistics)

Stimulus Item #3

— "Making U.S. Currency" (infographic)

A Few Notes:

There are a few things we'd like to highlight as your students get ready to dive into the Stimulus Items. First, these are actual sources that have been gathered for the topic at hand, even if they have been edited or adapted at times due to length, format, or readability. That means that they don't necessarily reflect our personal opinions, and we certainly don't want to take credit for the hard work of others (all source information will be provided). It does, however, provide a nice mix for your students.

Next, the Stimulus Items should give your students the background information they need to generate their responses to the Problem-Based Scenario. There is no need for you to seek out other resources or for students to do their own research.

With that said, it is always great if there is an opportunity for students to get on a computer or head to the library to find their own background information. Being able to conduct your own research is a vital skill to have, and it is referenced throughout Language Arts standards.

Again, this extra step is not necessary to successfully go through the exercise (we know you're already crunched for time!), but we figured it was worth mentioning!

Teacher Instruction Sheet

Problem-Based Scenario

Section 1 - Stimulus Review

Section 2 - Classroom Discussion

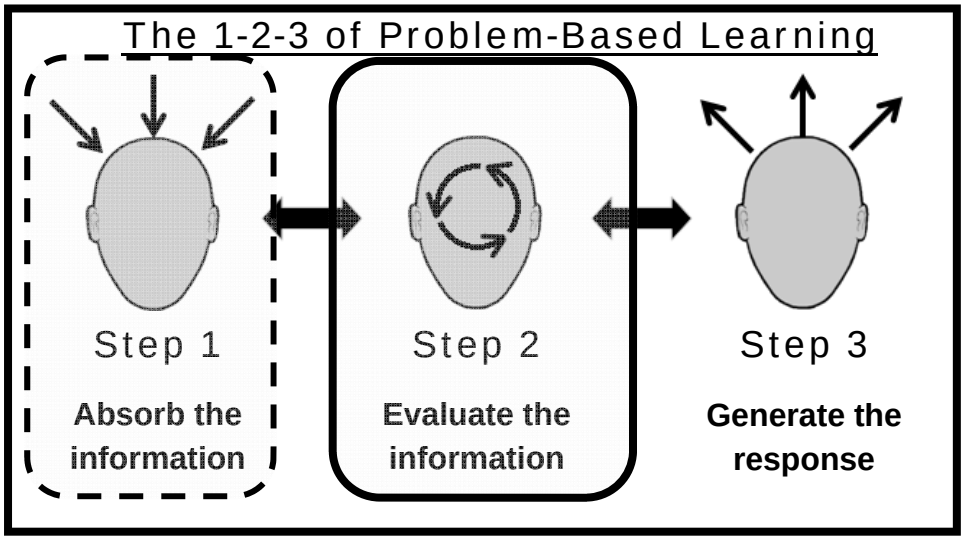
Section 3 - Student Response

Section 4 - Grading & Analysis

Classroom Discussion

The Classroom Discussion is Section 2 *on your* ***Teacher Instruction Sheet.***

Teacher "Quick Sheet"

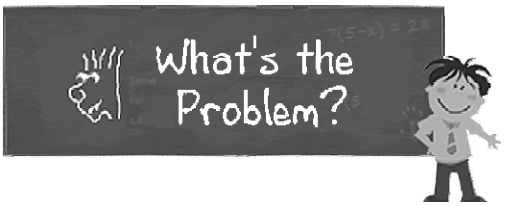


The MATH ANGLE

Now that your students have reviewed the Stimulus Items, it is a fitting time to have a **class discussion** about the Problem-Based Scenario (specifically, the "subject angle" that you're working with).

At this stage, there will be a limited amount of new information brought to the table (Step 1), although you might want to introduce ideas not covered in the Stimulus, and perhaps students will share original thoughts and experiences. For the most part, though, the classroom discussion is where you want students to evaluate the information (Step 2) to which they've been exposed. It is now that they will begin to organize it all and decide how it will fit together in their response.

The key to a classroom discussion, of course, is keeping everything focused and moving it in the direction you want, and at the same time creating a free environment for students to share and build on ideas. This is certainly where teachers earn their pay! One way we've tried to help (a little bit, at least) is to provide you with the talking points that work well for this scenario. The bold questions are what you will ask your students, and each has bullet points that you can use to guide the discussion.



Leading Questions for Classroom Discussion

The Penny Debate (math angle)

From a math perspective, what are reasons why it might be a good idea to get rid of the penny?

- Consider how the cost to produce the penny is starting to be much greater than its purchasing power
- Consider how the counting of pennies is a time-waster both for consumers and retail workers
- Consider that other countries (such as Canada) have already gotten rid of their pennies with no problems, and even the United States has made changes to its coinage in the past

From a math perspective, what are reasons why it would be a good idea to keep the penny?

- Consider how the cost of minting the penny (which costs far more than 1 cent) is misleading when you consider how long they stay in circulation (about 30 years), thus paying for itself many times over
- Consider how without the penny the price of products will have to be rounded (usually up) to the nearest nickel, creating a rise in prices across the board
- Consider how pennies can add up, and are often a major factor in charity drives
- Consider that based on survey analysis there is currently no public support to get rid of the penny (according to major polls), even if people believe there are cost benefits

How can the true cost and value of the penny be calculated?

- Consider that it is difficult to calculate the “true cost” of minting a penny since much of it is overhead costs at the coin minting plants (which would have to be paid whether the penny is minted or not)
- Consider the face value of the penny is 1 cent, which is based on its purchasing power (the amount that can be purchased with 1 cent is always changing a bit)
- Consider that the penny stays in circulation for 30 years, so its value is more than “one cent” because it is used over and over
- Consider that there is a “qualitative” value of the penny that is difficult to measure, such as sentimental value, or its value to charities that encourage penny donations

Teacher Instruction Sheet

Problem-Based Scenario

Section ① - Stimulus Review

Section ② - Classroom Discussion

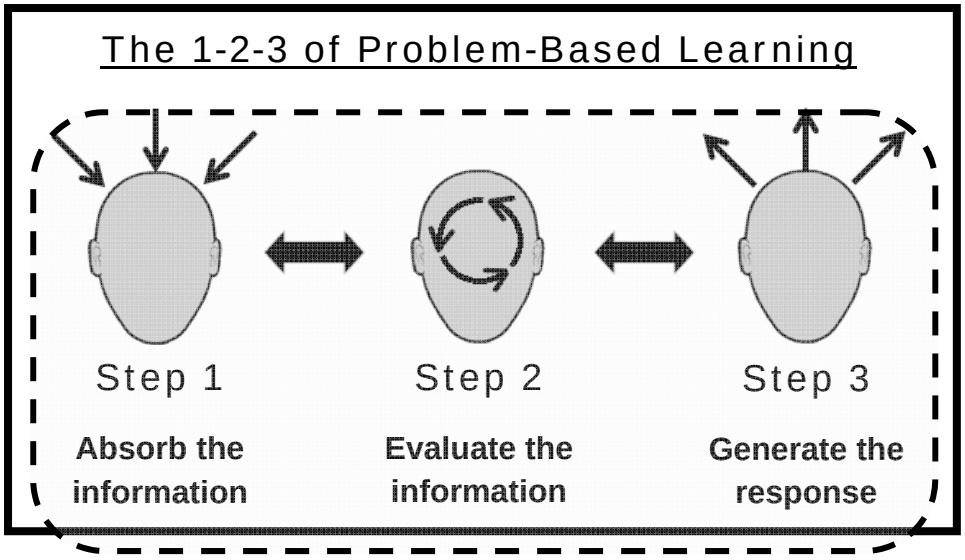
Section ③ - Student Response

Section ④ - Grading & Analysis

"Thought-Gathering" Sheet

The "Thought-Gathering" Sheet is an interim step prior to the student responses.

Student Handout



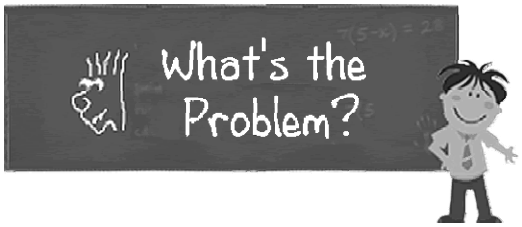
The MATH ANGLE

So, by this point, you've had students review Stimulus Items related to the Problem Scenario. That led to a stimulating (we hope) classroom discussion on the topic.

Often times, there is a feeling of "information overload" at this stage. Students have enough information to generate their constructed responses and/or fulfill their product options (we'll talk about these on the upcoming pages), but their thoughts may be all over the place. They may still have to pick their position, refine their arguments, focus their proposal, perfect their design… and so on.

That's where the **"Thought-Gathering" Sheet** comes in. This isn't to be confused with any "note-taking sheets" your students may have written while they were looking through the Stimulus Items or listening to the discussion. Rather, this is a final stage where they sort everything (including their own notes) to prepare for their response. It is a chance to tie together Step 1, Step 2, and Step 3 (shown above).

We have provided a "Thought-Gathering" sheet that works with this exercise and is a good chance for students to organize their ideas prior to creating their responses.



Penny Debate

"Thought-Gathering" Sheet

Ways that the "penny debate" involves math:

Numbers, stats, & data that suggest we should <u>keep</u> the penny:	Numbers, stats, & data that suggest we should <u>get rid of</u> the penny:

Teacher Instruction Sheet

Problem-Based Scenario

Section 1 - Stimulus Review

Section 2 - Classroom Discussion

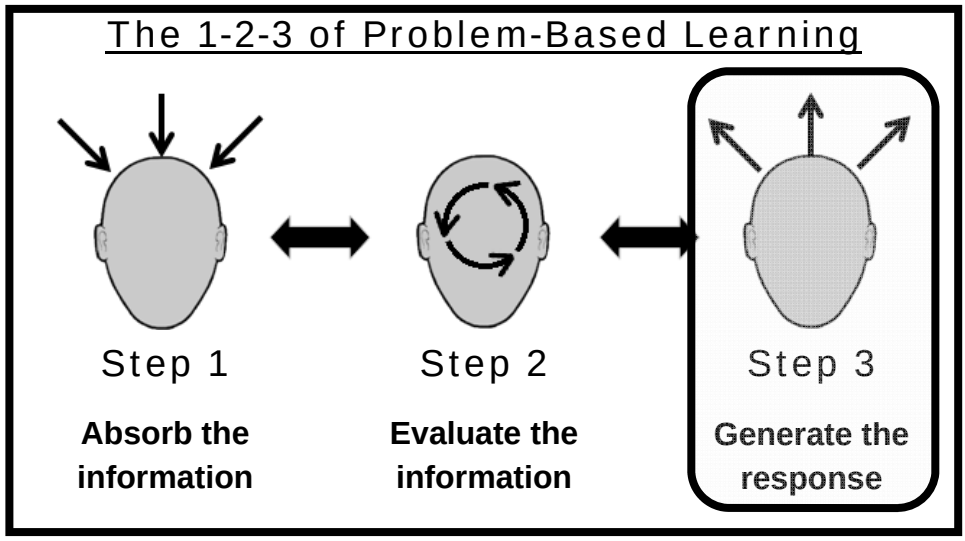
Section 3 - Student Response

Section 4 - Grading & Analysis

Student Responses
(Extended Response)

The Student Responses are Section 3 *on your* ***Teacher Instruction Sheet.***

Student Handout



The MATH ANGLE

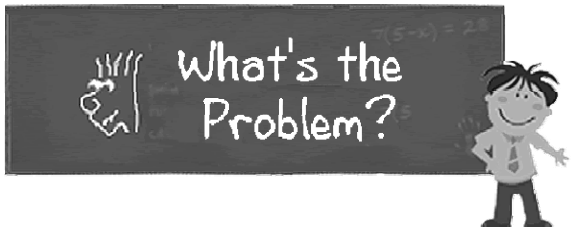
On your Teacher Instruction sheet, you'll see that each scenario provides two types of response options for your students—Extended Responses and the Product Option. Let's look at the **"Extended Responses"** first.

As you would expect, the Extended Responses are simply questions centering around the Problem-Based Scenario that the students answer through their writing.

Most likely, the Extended Responses are similar to what you might see during a Performance Task of a comprehensive assessment (where students are given a range of information to review, and then must give their conclusions based on the evidence). The "test prep" benefits alone make it worthwhile for students to complete the Extended Responses, but the broader benefit is their ability to take the information they've been exposed to and generate a logical response to a problem scenario.

The rubric and process for grading Extended Responses is on the following pages. Also, we will leave it up to you whether you want to allow students to use notes they have taken throughout (we think it's fine for them to do so), and also how strict you want to be with time limits (a half hour or so should be fine).

Here are the Extended Response questions for this scenario.



What do you think?

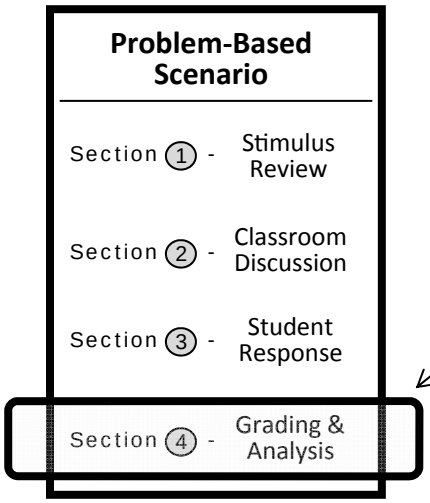
The questions below are centered around the Problem-Based Scenario you've been reviewing. Please answer the questions on separate sheets of paper.

1) **It can easily be seen that it costs more than one-cent to mint a one-cent penny. However, what other mathematical calculations are needed to truly figure the "cost" of the penny compared to its value?**

2) **Based on mathematical factors (as opposed to personal feelings or tradition), does it make sense to get rid of the penny? Why or why not?**

★ *Remember to support your answers with evidence that you've gathered from what you've read and discussed in class!*

Teacher Instruction Sheet



Grading Rubric
(Extended Responses)

The Grading Rubric is Section 3 *on your* ***Teacher Instruction Sheet.***

Student Handout

The MATH ANGLE

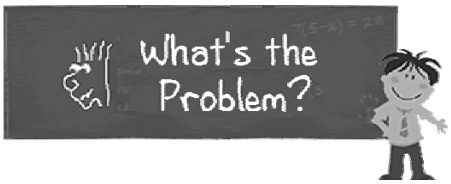
One thing that your students must understand about these Problem-Based Scenarios is that the answer is never "yes" or "no". Instead, students must think their way through the muddy waters of different situations and challenges, while you guide them along the journey.

Of course, the end result needs to be more than a pat on the back—and that's why proper grading is so important. While students may feel that grades exist only to cause stress and fill the blank spaces on a report card, the broader reason is that when students are graded in a clear and fair way, it enables them to continually improve their approach and response.

The Extended Responses for this scenario can be graded using the rubric to the right. It is divided into four sections:

1) Math Content (*What do you want students to bring to the table based on previous lessons?)*
2) Writing Focus *(Was it clear what point the students were trying to make?)*
3) Use of Evidence *(Did the students back up their position with evidence, quotes, statistics, and facts?)*
4) Language & Conventions (*Did students limit mistakes and respond in a thorough and professional manner?)*

Here is a copy of the rubric for your students to review.



How do I get an A?

Listed below are the four different areas that will be evaluated as your responses are graded. Be sure to consider each area as you write.

Rubric Section #1: Math Content – you must show a high level of background knowledge and general understanding of the topic

**in other words: *What are you bringing to the table based on previous lessons?*

4	3	2	1	NS
You proved throughout your response to have a high level of background knowledge of the subject.	**You showed a reasonable level of background knowledge through most of your response.**	**You showed a limited level of background knowledge, and only in certain parts of your response.**	**You showed barely any background knowledge of the subject throughout your response.**	**Your response was incoherent, off-topic, or unable to be read.**

Rubric Section #2: Production & Distribution of Writing – you must organize and sustain your writing based on a defined purpose

**in other words: *Was it clear what point you were trying to make, and did you focus on that point?*

4	3	2	1	NS
Your response had a defined purpose, and it was organized with a clear focus on that purpose.	**Your response had a defined purpose, although it lacked organization and a clear focus on that purpose.**	**The purpose of your response was a bit vague, and there was limited organization and focus.**	**There was no defined purpose or organization to your response.**	**Your response was incoherent, off-topic, or unable to be read.**

Rubric Section #3: Integration of Knowledge and Ideas (use of "evidence") – you must support your arguments and positions with outside information (i.e. "stimulus items")

**in other words: *Did you back up your position with evidence, quotes, statistics, and facts?*

4	3	2	1	NS
You provided convincing support/evidence for your main idea and included appropriate sources, facts, & details.	**You provided adequate support/evidence for your main idea and only limited sources, facts, & details.**	**You provided only modest support/ evidence for your main idea and it was not strengthened by sources, facts, & details.**	**You provided almost no support/evidence for your main idea.**	**Your response was incoherent, off-topic, or unable to be read.**

Rubric Section #4: Language & Conventions – you must use proper grammar, spelling, vocabulary, and other conventions of the English language

**in other words: *Did you limit mistakes and respond in a thorough and professional manner?*

4	3	2	1	NS
Your response was professional and you demonstrated a command of language conventions.	**Your response was mostly professional with limited errors related to language conventions.**	**Your response was rather sloppy with multiple errors related to language conventions.**	**Your response was completely sloppy and showed no effort to follow language conventions.**	**Your response was incoherent, off-topic, or unable to be read.**

Teacher Instruction Sheet

Problem-Based Scenario

Section ① - Stimulus Review

Section ② - Classroom Discussion

Section ③ - Student Response

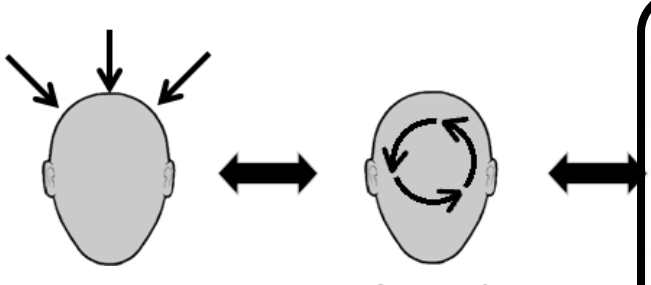
Section ④ - Grading & Analysis

Student Responses
("Product Option")

The Student Responses are Section 3 *on your* ***Teacher Instruction Sheet.***

Student Handout

The 1-2-3 of Problem-Based Learning



Step 1	Step 2	Step 3
Absorb the information	**Evaluate the information**	**Generate the response**

The MATH ANGLE

It all leads up to this—***"The Product Option."*** It is here that students will have the "thinking muscle" truly stretched and those 21st Century Skills (collaboration, communication, technology, and so on) will be finely tuned.

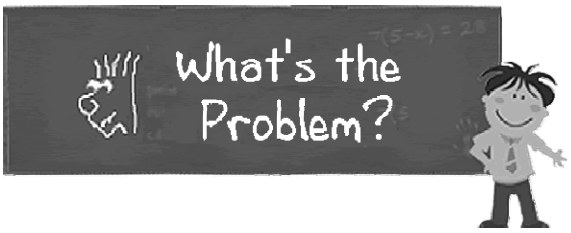
Let's start with a very simple definition:

The Product Option – where students are asked to "produce" something

Yes, this is very broad, and could include any of the following (and so much more):

Bulletin Board	Advertisement	Chart	Role Play	Tips / Suggestions
Letter	Cartoon	Pop-up / Child Book	Commercial	Slogan / Motto
Comic Strip	Play	Collage	Riddles / Jokes	Marketing Plan
Movie Trailer	Poster / Artwork	Timeline	Graphic Organizer	Jingle
Demonstration	Political Cartoon	Prototype	Brochure	Campaign Platform
Diary Entry	Costume	Crossword Puzzle	Poem	Experiment
Editorial Essay	Newspaper Article	Database / Spreadsheet	Rap Song	Mosaic
Map	Diorama	Oral Report	Webpage	Argument
Lesson Plan	Display	Rebus Story	Instruction Manual	Proposal
Fiction Story	Mock Interview	Slide Show	Petition	Illustrated Story
Interview	Survey	Recipe / Instructions	Game	Radio show

After you divide your students into teams, photocopy the next page to outline the Product Option for this scenario.



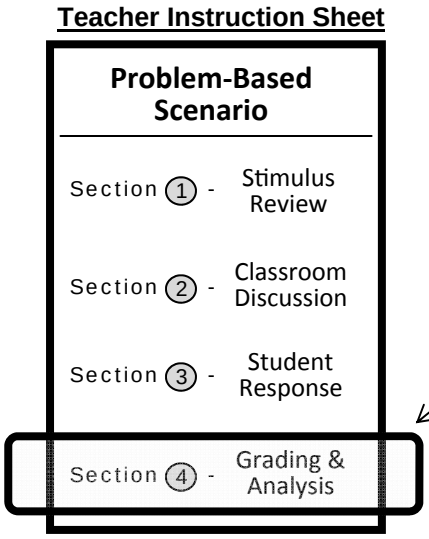
The task at hand...

Working to produce something as a team can help you gain a better understanding of the problem-scenario. Please work together on the exercise below:

Your group is serving as **economic advisors** to the United States government. You need to **prepare an oral and visual presentation** to a Senate Committee that is trying to decide whether or not to get rid of the one-cent penny. The committee has asked your team to answer one question: *"What is the true value of the penny compared to its true cost to mint?"*

Of course, it is your job to help the committee understand that calculating "true value" and "true cost" can be complicated when you consider factors such as fixed costs in the minting process (i.e. the costs to run and manage the minting factory regardless of which type of coins are being minted), the lifespan of the penny, and the amount of times it is used over that lifespan.

Based on the numbers and your best estimates, give your recommendation to the committee as to whether to include or remove the penny from our from our monetary system.



Grading Rubric
(Product Option)

The Grading Rubric is Section 3 *on your* ***Teacher Instruction Sheet.***

Student Handout

We mention this time and time again through this book, and it's worth saying another time:

It's all about the process.

The purpose of these exercises is to allow students to think through problems and situations, and it's the teacher's role to guide them through the journey.

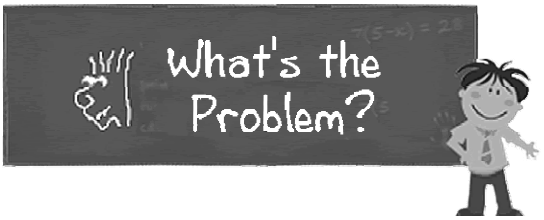
Without a doubt, your students will remind you that "it's all about the process" when they try to convince you to be gentle during the grading process. After all, they've been brought up to bubble in the correct circle with a #2 pencil, so to being asked to "produce" something from a variety of information can be tricky. But they'll do just fine.

As students work through the process, they will learn subject-specific skills and cover a few important standards. Yet they'll also be developing those 21st century skills and lifelong traits that we mention throughout this book (a few are listed below).

- **Critical Thinking**
- **Collaboration**
- **Entrepreneurialism**
- **Patience / Perseverance**
- **Researching**
- **Leadership**
- **Self-Direction**
- **Listening**
- **Creativity**
- **Technological Ability**
- **Internet / Media Literacy**
- **Healthy Skepticism**
- **Planning**
- **Social Awareness**
- **Data Analysis**
- **Imagination**
- **Communication**
- **Scientific Literacy**
- **Personal Expression**
- **Flexibility / Adaptability**

It's difficult to put a hard grade on any of those, and it isn't the final goal. If you live by the mantra, "*It's all about the process,*" these skills will indeed be developed. With that said, you do want to provide worthwhile feedback to your students. We use a simple—but sound—rubric to help students "ace the **TEST**" (a clever acronym to help them remember the key steps). The rubric is provided to the right for your convenience.

Photocopy this scoring sheet for your students to review.



How do I get an A?

As you work in teams on this exercise, you will be evaluated to see if you ace the **TEST:**

Thoroughness
Evidence
Strategy
Teamwork

Thoroughness

_____ **The group completed all of the required tasks** (15 points)

_____ **Everyone followed directions throughout the process** (15 points)

Evidence

_____ **The group's final product was logical and could be defended** (15 points)

_____ **A variety of evidence was provided to support the product** (10 points)

Strategy

_____ **The group kept its focus on the requirements of the product** (15 points)

_____ **The group used a sound approach in completing the exercise** (10 points)

Teamwork

_____ **Everyone in the group participated and played a key role** (10 points)

_____ **All members of the group worked well together** (10 points)

Shown above are general areas that your teacher will be evaluating as he or she scores the products you create with your team. You may be provided more details about what it takes to receive the full value in any one of these areas.

Section 3:

"The Science Angle"

Teacher Instruction Sheet

The Main Problem Scenario:

You are an economic advisor who has been asked to decide on the future of the penny. Do we need the one-cent coin, or is it time to get rid of it?

The "Science Angle":

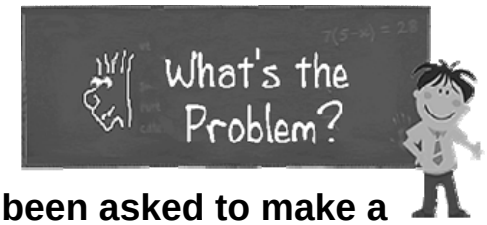
What materials and resources are used in the process of making the penny?

The SCIENCE ANGLE

*Your **Teacher Instruction** page is shown to the right. A unique Teacher Instructions sheet is created for each "subject angle" of the Main Problem Scenario, and walks through the entire process of viewing the problem from that point-of-view. Everything that is referenced in the Teacher Instructions (student stimulus items, classroom discussion sheets, thought-gathering sheets, rubrics) will be provided as you work through the exercise.*

Make a photocopy of the Teacher Instructions to walk you through the entire "science angle"

Teacher Instructions:



"The Penny Debate"

Problem Scenario: **You are an economic advisor who has been asked to make a recommendation about the future of the penny. The one-cent coin is the smallest currency we have in circulation (and what you can buy with it goes down every year). It has been argued that it's time to get rid of the penny, while others feel that choice would have a negative impact. What is the correct course of action?**

Your students will be viewing this problem from a SCIENCE perspective.

What materials and resources are used in the process of making the penny?

Students will review the science involved in the making of the penny, as well as the natural resources needed, and determine if that should be factored into the decision about whether to continue minting the coin.

Step 1 — Review Stimulus Items

Stimulus Item #1 — "Minting Process Revealed" (list of steps)

Stimulus Item #2 — "The Environmental Impact of the Penny" (article)

Stimulus Item #3 — "Making the Penny Better" (editorial)

***Students should take notes as they review the Stimulus Items*

Step 2 — Classroom Discussion

Lead a **class discussion** about issues related to the topic.
You are being provided a sheet to help you guide the classroom discussion.

Extended Response: Have students answer the following questions. Remind students to use information from the Stimulus Items to support their response.

1) **What raw materials are used to currently make the penny, and how does the entire process have an impact the environment?**

2) **Would removing pennies from our monetary system be good for the environment? Why or why not? Can changes be made to reduce any negative impact?**

Step 3 — Student Response

****students should have access to their notes as they enter their answers*

****students may also have access to the Stimulus Items as they enter their answers*

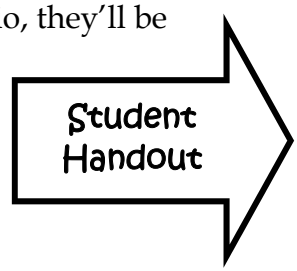
Product Option: Divide your students into groups, with each group serving as **environmental experts**. The groups have heard the debate about whether or not to get rid of the penny, and have noticed that most of those debates center around the cost, value, and even the public's reaction. One key factor that seems to be missing is the environmental impact of minting the penny. The groups must **write an editorial** to explain what this impact is, and whether there are steps that can be taken to reduce any negative results. The purpose of this editorial is to keep decision-makers from focusing only on the economic value and public sentiment surrounding the penny, but rather to make the decision based on all of the factors. Share the editorials as a class and discuss how the information might be used by a person making the decision. Why might a choice be made to continue minting the penny even if there is some negative impact on the environment?

Step 4 — Analysis

Rubrics to grade student entries have been provided, and all questions have been mapped to the content standards.

Science Standards

As students work through this section of our Problem-Based Scenario, they'll be focusing on several science content areas. This includes:



- **Earth's Materials**
- **The Environment**

In addition—and perhaps more importantly—students will need to take on a scientific frame of mind (in academic circles, these are referred to as the "Science and Engineering Practices"), which is a key benefit of Problem-Based Learning. This means that students will need to:

- **Asking questions and defining problems.**
- **Constructing explanations and designing solutions.**
- **Engaging in argument from evidence.**
- **Obtaining, evaluating, and communicating information**

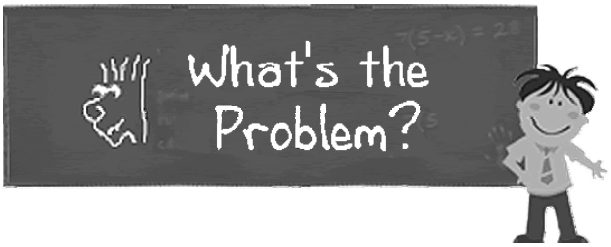
You may want to share the goals listed above with your students prior to beginning the exercise, but the best part is that they'll be developing these skills whether they realize it or not!

The most important thing to remember when introducing the Problem-Based Scenario is to grab student interest right away. It is a fun and challenging exercise, and you certainly want students to approach it that way.

To make this easy for you, we have created a handout to introduce the "science angle" to your students for this Problem-Based Scenario. This will help them see that they will be looking at the Main Problem Scenario from a specific point-of-view, in this case with a scientific focus.

Make photocopies of the next page to introduce the "Science Angle" of this Problem-Scenario to your students

The SCIENCE ANGLE



Are you ready to tackle the problem?

The Scenario:

You are an economic advisor who has been asked to make a recommendation about the future of the penny. The one-cent coin is the smallest currency we have in circulation (and what you can buy with it goes down every year). It has been argued that it's time to get rid of the penny, while others feel that choice would have a negative impact. What is the correct course of action?

In order to properly respond to a complicated problem like the one above, you must view it from different points-of-view. In this case, we will consider the following:

Something to think about:

What materials and resources are used in the process of making the penny?

Prior to giving your response, you will review multiple resources, engage in classroom discussion, and take time to organize your thoughts.

In this exercise, you will review the science involved in the making of the penny, as well as the natural resources needed, and determine if that should be factored into the decision about whether to continue minting the coin.

★ *As you work on this exercise, remember that this is primarily a **science question**. This means that scientific facts will be needed to support your ideas, and you'll also want to maintain a healthy skepticism throughout the exercise!*

Teacher Instruction Sheet

Problem-Based Scenario

Section 1 - Stimulus Review

Section 2 - Classroom Discussion

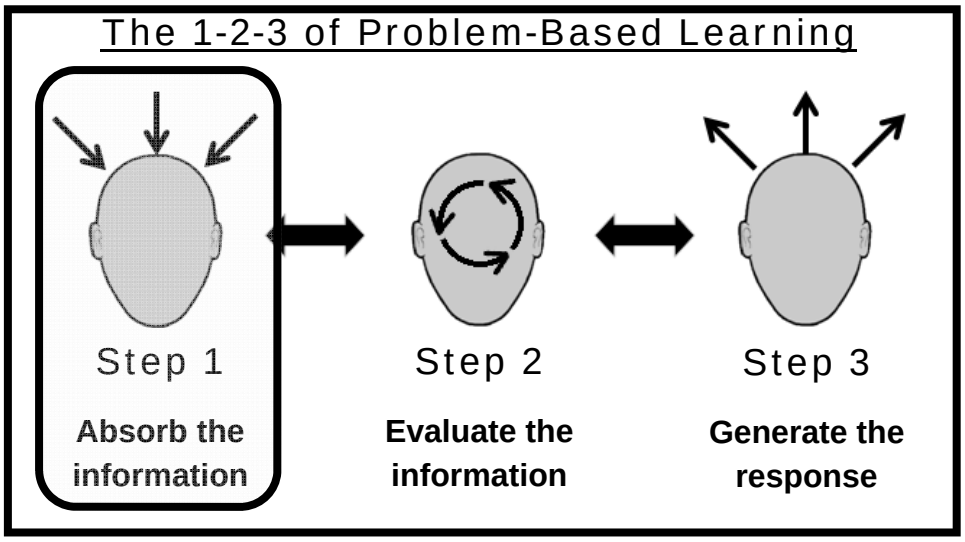
Section 3 - Student Response

Section 4 - Grading & Analysis

Stimulus Review

The Stimulus Review is Section 1 *on your* ***Teacher Instruction Sheet.***

The SCIENCE ANGLE



It's a fancy term, but the "Stimulus Review" is simply the first step in Problem-Based Learning where students review a variety of information surrounding the specific problem or challenge.

In our Problem Scenario, all of the Stimulus Items have been provided for you. We have intentionally gathered a variety of different types and sources. This is important in today's modern world where information comes from all directions, and also sets the stage for Step 2 (Evaluating the Information).

A few examples of the types of Stimulus Items you might see in a Problem-Based Scenario include:

- **Articles**
- **Videos**
- **Infographics**
- **Blogs**
- **Statistics**
- **Lists**
- **Websites**
- **Editorials**
- **Audio Recordings**
- **Cartoons**
- **Primary Sources**
- **Advertisements**

…and much more!

For your convenience, we've placed all of the Stimulus Items for this Problem-Based Scenario on a special website where **both you and your students** can have full access to them. To access these resources, you will go to:

http://www.pblproject.com/students

Login: **penny**
Password: **eb96**

The Stimulus Items you'll see for this section of the exercise include:

Stimulus Item #1

— "Minting Process Revealed" (list of steps)

Stimulus Item #2

— "Environmental Impact of the Penny" (article)

Stimulus Item #3

— "Making the Penny Better" (editorial)

A Few Notes:

There are a few things we'd like to highlight as your students get ready to dive into the Stimulus Items. First, these are actual sources that have been gathered for the topic at hand, even if they have been edited or adapted at times due to length, format, or readability. That means that they don't necessarily reflect our personal opinions, and we certainly don't want to take credit for the hard work of others (all source information will be provided). It does, however, provide a nice mix for your students.

Next, the Stimulus Items should give your students the background information they need to generate their responses to the Problem-Based Scenario. There is no need for you to seek out other resources or for students to do their own research.

With that said, it is always great if there is an opportunity for students to get on a computer or head to the library to find their own background information. Being able to conduct your own research is a vital skill to have, and it is referenced throughout Language Arts standards.

Again, this extra step is not necessary to successfully go through the exercise (we know you're already crunched for time!), but we figured it was worth mentioning!

Teacher Instruction Sheet

Problem-Based Scenario

Section 1 - Stimulus Review

Section 2 - Classroom Discussion

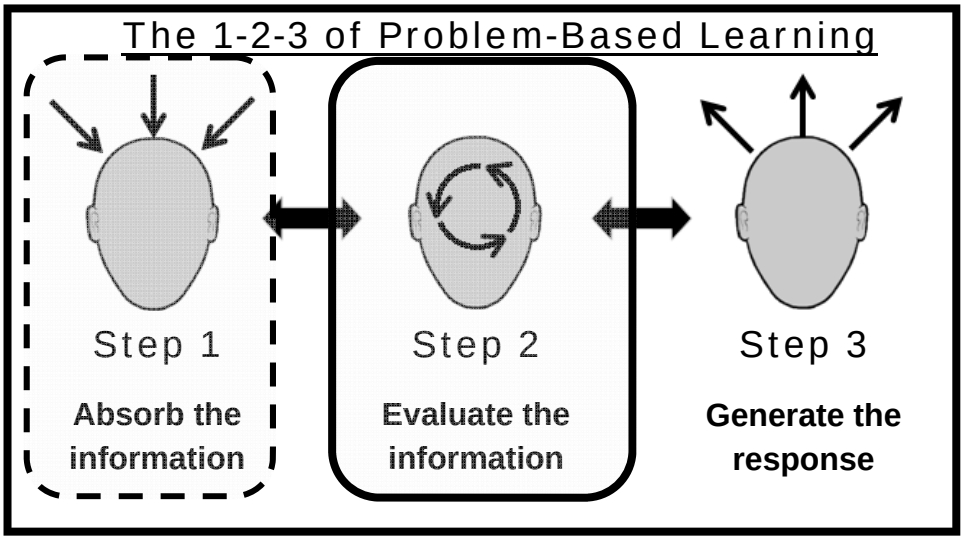
Section 3 - Student Response

Section 4 - Grading & Analysis

Classroom Discussion

The Classroom Discussion is Section 2 *on your* ***Teacher Instruction Sheet.***

Teacher "Quick Sheet"

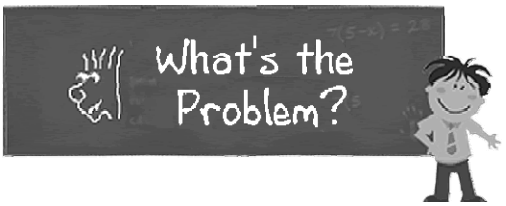


The SCIENCE ANGLE

Now that your students have reviewed the Stimulus Items, it is a fitting time to have a **class discussion** about the Problem-Based Scenario (specifically, the "subject angle" that you're working with).

At this stage, there will be a limited amount of new information brought to the table (Step 1), although you might want to introduce ideas not covered in the Stimulus, and perhaps students will share original thoughts and experiences. For the most part, though, the classroom discussion is where you want students to evaluate the information (Step 2) to which they've been exposed. It is now that they will begin to organize it all and decide how it will fit together in their response.

The key to a classroom discussion, of course, is keeping everything focused and moving it in the direction you want, and at the same time creating a free environment for students to share and build on ideas. This is certainly where teachers earn their pay! One way we've tried to help (a little bit, at least) is to provide you with the talking points that work well for this scenario. The bold questions are what you will ask your students, and each has bullet points that you can use to guide the discussion.



Leading Questions for Classroom Discussion

The Penny Debate (science angle)

How is a penny made?

- Consider the raw materials used to make a penny, which is mostly zinc and a small percentage of copper (the penny used to be mostly copper)
- Consider basic steps of making a penny, including the creation of the die (a template for the coin), rolling large sheets of the metal, and cutting the sheets with the die
- Consider that it takes a tremendous amount of machinery and energy to mint several billion pennies each year

Is the minting of pennies bad for the environment?

- Consider that raw materials must be mined to mint the coin (the penny used to be mainly copper, which had a major environmental impact… now, it is primarily zinc, which still results in some environmental concerns)
- Consider the energy used and waste generated by factories creating billions of pennies each year
- Consider that there are billions of pennies in circulation, and many are literally thrown away or ignored

Are there ways to limit the environmental impact of minting the penny?

- Consider that the raw materials used to make the penny can always be changed (in 1982, the coin was switched from mostly copper to mostly zinc)
- Consider that we do not need to get rid of the penny to help the environment…, it might be worthwhile to simply mint less of them each year (there will still be billions already in circulation)
- Consider that machinery to mint coins should always be improved and updated because they are constantly in use, and environmental safety should be a major factor in these improvements

Teacher Instruction Sheet

Problem-Based Scenario

Section ① - Stimulus Review

Section ② - Classroom Discussion

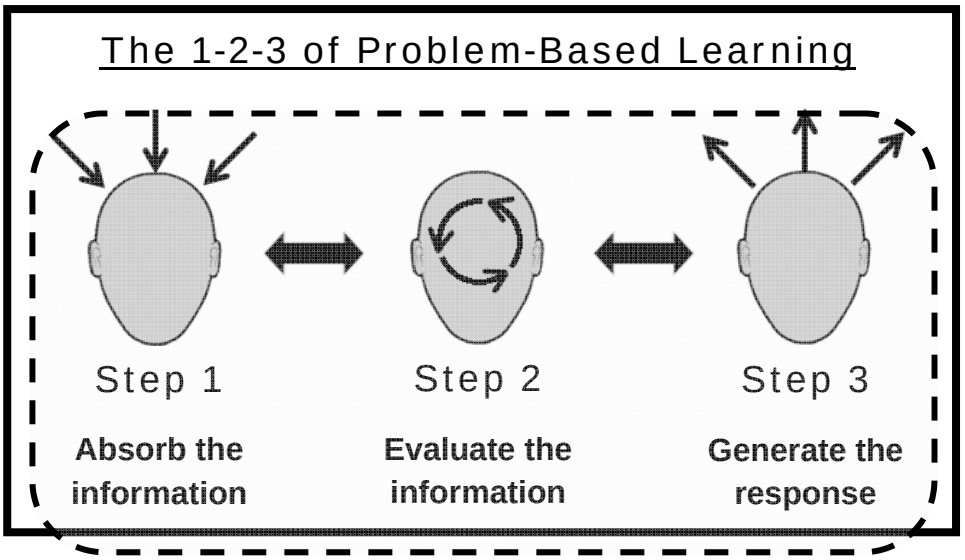
Section ③ - Student Response

Section ④ - Grading & Analysis

"Thought-Gathering" Sheet

The "Thought-Gathering" Sheet is an interim step prior to the student responses.

Student Handout



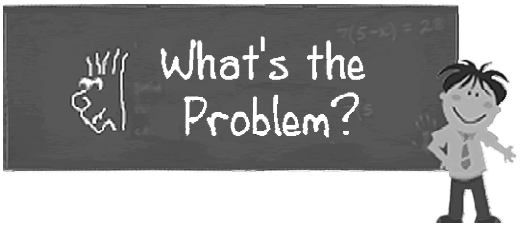
The SCIENCE ANGLE

So, by this point, you've had students review Stimulus Items related to the Problem Scenario. That led to a stimulating (we hope) classroom discussion on the topic.

Often times, there is a feeling of "information overload" at this stage. Students have enough information to generate their constructed responses and/or fulfill their product options (we'll talk about these on the upcoming pages), but their thoughts may be all over the place. They may still have to pick their position, refine their arguments, focus their proposal, perfect their design… and so on.

That's where the **"Thought-Gathering" Sheet** comes in. This isn't to be confused with any "note-taking sheets" your students may have written while they were looking through the Stimulus Items or listening to the discussion. Rather, this is a final stage where they sort everything (including their own notes) to prepare for their response. It is a chance to tie together Step 1, Step 2, and Step 3 (shown above).

We have provided a "Thought-Gathering" sheet that works with this exercise and is a good chance for students to organize their ideas prior to creating their responses.



Penny Debate

"Thought-Gathering" Sheet

What materials and resources are needed to make a penny?

_____

_____

_____

_____

_____

Environmental Impact of Making a Penny:
Ways to Improve the Process:

Teacher Instruction Sheet

Problem-Based Scenario

Section 1 - Stimulus Review

Section 2 - Classroom Discussion

Section 3 - Student Response

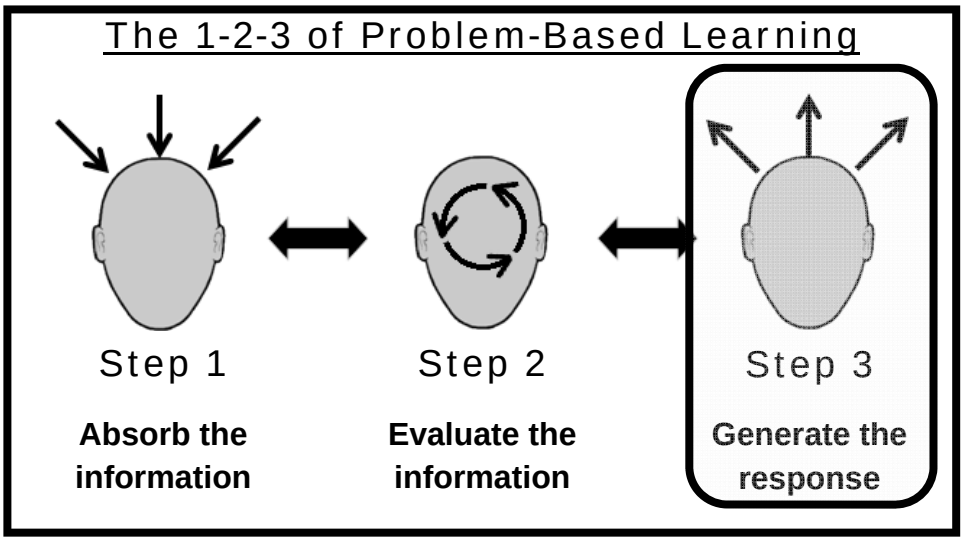
Section 4 - Grading & Analysis

Student Responses
(Extended Response)

The Student Responses are Section 3 *on your* ***Teacher Instruction Sheet.***

Student Handout

The SCIENCE ANGLE



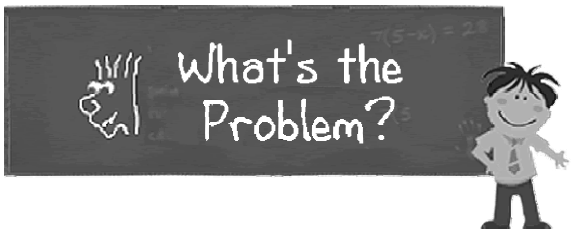
On your Teacher Instruction sheet, you'll see that each scenario provides two types of response options for your students—Extended Responses and the Product Option. Let's look at the **"Extended Responses"** first.

As you would expect, the Extended Responses are simply questions centering around the Problem-Based Scenario that the students answer through their writing.

Most likely, the Extended Responses are similar to what you might see during a Performance Task of a comprehensive assessment (where students are given a range of information to review, and then must give their conclusions based on the evidence). The "test prep" benefits alone make it worthwhile for students to complete the Extended Responses, but the broader benefit is their ability to take the information they've been exposed to and generate a logical response to a problem scenario.

The rubric and process for grading Extended Responses is on the following pages. Also, we will leave it up to you whether you want to allow students to use notes they have taken throughout (we think it's fine for them to do so), and also how strict you want to be with time limits (a half hour or so should be fine).

Here are the Extended Response questions for this scenario.



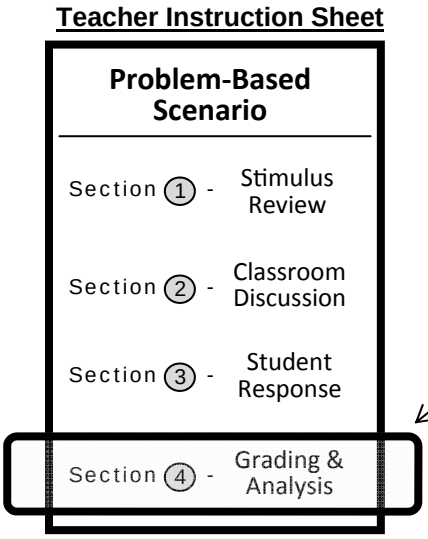
What do you think?

The questions below are centered around the Problem-Based Scenario you've been reviewing. Please answer the questions on separate sheets of paper.

1) **What raw materials are used to currently make the penny, and how does the entire process have an impact the environment?**

2) **Would removing pennies from our monetary system be good for the environment? Why or why not? Can changes be made to reduce any negative impact?**

★ *Remember to support your answers with evidence that you've gathered from what you've read and discussed in class!*



Grading Rubric
(Extended Responses)

The Grading Rubric is Section 3 *on your* ***Teacher Instruction Sheet.***

Student Handout

The SCIENCE ANGLE

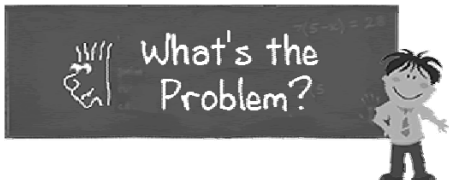
One thing that your students must understand about these Problem-Based Scenarios is that the answer is never "yes" or "no". Instead, students must think their way through the muddy waters of different situations and challenges, while you guide them along the journey.

Of course, the end result needs to be more than a pat on the back—and that's why proper grading is so important. While students may feel that grades exist only to cause stress and fill the blank spaces on a report card, the broader reason is that when students are graded in a clear and fair way, it enables them to continually improve their approach and response.

The Extended Responses for this scenario can be graded using the rubric to the right. It is divided into four sections:

1) Science Content (*What do you want students to bring to the table based on previous lessons?)*
2) Writing Focus *(Was it clear what point the students were trying to make?)*
3) Use of Evidence *(Did the students back up their position with evidence, quotes, statistics, and facts?)*
4) Language & Conventions (*Did students limit mistakes and respond in a thorough and professional manner?)*

Here is a copy of the rubric for your students to review.



How do I get an A?

Listed below are the four different areas that will be evaluated as your responses are graded. Be sure to consider each area as you write.

Rubric Section #1: Science Content – you must show a high level of background knowledge and general understanding of the topic

**in other words: *What are you bringing to the table based on previous lessons?*

4	3	2	1	NS
You proved throughout your response to have a high level of background knowledge of the subject.	**You showed a reasonable level of background knowledge through most of your response.**	**You showed a limited level of background knowledge, and only in certain parts of your response.**	**You showed barely any background knowledge of the subject throughout your response.**	**Your response was incoherent, off-topic, or unable to be read.**

Rubric Section #2: Production & Distribution of Writing – you must organize and sustain your writing based on a defined purpose

**in other words: *Was it clear what point you were trying to make, and did you focus on that point?*

4	3	2	1	NS
Your response had a defined purpose, and it was organized with a clear focus on that purpose.	**Your response had a defined purpose, although it lacked organization and a clear focus on that purpose.**	**The purpose of your response was a bit vague, and there was limited organization and focus.**	**There was no defined purpose or organization to your response.**	**Your response was incoherent, off-topic, or unable to be read.**

Rubric Section #3: Integration of Knowledge and Ideas (use of "evidence") – you must support your arguments and positions with outside information (i.e. "stimulus items")

**in other words: *Did you back up your position with evidence, quotes, statistics, and facts?*

4	3	2	1	NS
You provided convincing support/evidence for your main idea and included appropriate sources, facts, & details.	**You provided adequate support/evidence for your main idea and only limited sources, facts, & details.**	**You provided only modest support/ evidence for your main idea and it was not strengthened by sources, facts, & details.**	**You provided almost no support/evidence for your main idea.**	**Your response was incoherent, off-topic, or unable to be read.**

Rubric Section #4: Language & Conventions – you must use proper grammar, spelling, vocabulary, and other conventions of the English language

**in other words: *Did you limit mistakes and respond in a thorough and professional manner?*

4	3	2	1	NS
Your response was professional and you demonstrated a command of language	**Your response was mostly professional with limited errors related to language conventions.**	**Your response was rather sloppy with multiple errors related to language**	**Your response was completely sloppy and showed no effort to follow language**	**Your response was incoherent, off-topic, or unable to be read.**

Teacher Instruction Sheet

Problem-Based Scenario

Section 1 - Stimulus Review

Section 2 - Classroom Discussion

Section 3 - Student Response

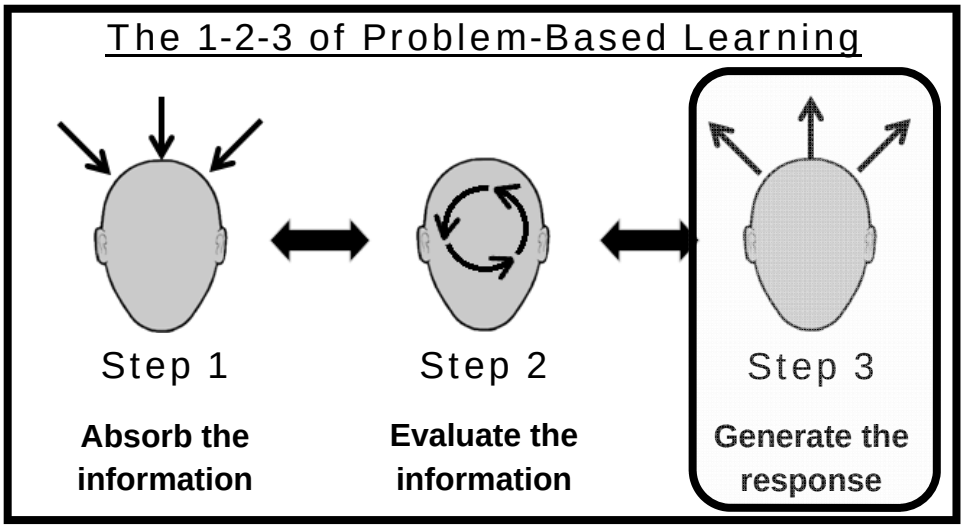
Section 4 - Grading & Analysis

Student Responses
("Product Option")

The Student Responses are Section 3 *on your* ***Teacher Instruction Sheet.***

Student Handout

The SCIENCE ANGLE



It all leads up to this—***"The Product Option."*** It is here that students will have the "thinking muscle" truly stretched and those 21st Century Skills (collaboration, communication, technology, and so on) will be finely tuned.

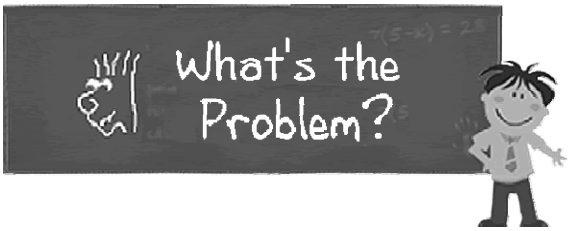
Let's start with a very simple definition:

The Product Option – where students are asked to "produce" something

Yes, this is very broad, and could include any of the following (and so much more):

Bulletin Board	Advertisement	Chart	Role Play	Tips / Suggestions
Letter	Cartoon	Pop-up / Child Book	Commercial	Slogan / Motto
Comic Strip	Play	Collage	Riddles / Jokes	Marketing Plan
Movie Trailer	Poster / Artwork	Timeline	Graphic Organizer	Jingle
Demonstration	Political Cartoon	Prototype	Brochure	Campaign Platform
Diary Entry	Costume	Crossword Puzzle	Poem	Experiment
Editorial Essay	Newspaper Article	Database / Spreadsheet	Rap Song	Mosaic
Map	Diorama	Oral Report	Webpage	Argument
Lesson Plan	Display	Rebus Story	Instruction Manual	Proposal
Fiction Story	Mock Interview	Slide Show	Petition	Illustrated Story
Interview	Survey	Recipe / Instructions	Game	Radio show

After you divide your students into teams, photocopy the next page to outline the Product Option for this scenario.



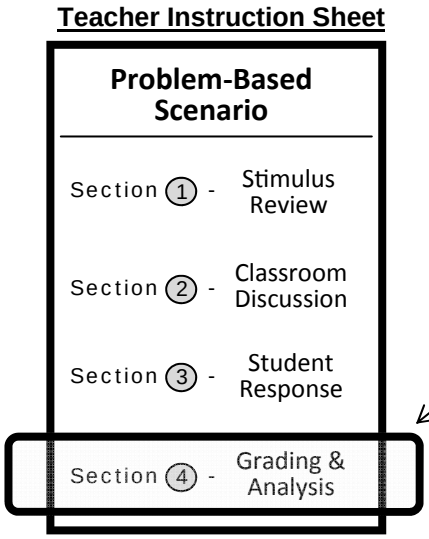
The task at hand...

Working to produce something as a team can help you gain a better understanding of the problem-scenario. Please work together on the exercise below:

Your group is a team of **environmental experts**. You have heard the debate about whether or not to get rid of the penny, and have noticed that most of the arguments center around the cost, value, and even the public's reaction. One key factor that seems to be missing is the environmental impact of minting the penny.

With your group, **write an editorial** to explain what the environmental impact of minting the penny is, and whether there are steps that can be taken to reduce any negative results. The purpose of this editorial is to keep decision-makers from focusing only on the economic value and public sentiment surrounding the penny, but rather to make the decision based on all of the factors.

Share the editorials as a class and discuss how the information might be used by a person making the decision. Why might a choice be made to continue minting the penny even if there is some negative impact on the environment?



Grading Rubric
(Product Option)

The Grading Rubric is Section 3 *on your* ***Teacher Instruction Sheet.***

Student Handout

The SCIENCE ANGLE

We mention this time and time again through this book, and it's worth saying another time:

It's all about the process.

The purpose of these exercises is to allow students to think through problems and situations, and it's the teacher's role to guide them through the journey.

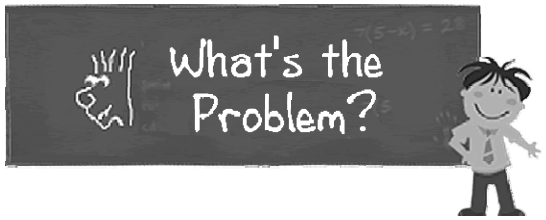
Without a doubt, your students will remind you that "it's all about the process" when they try to convince you to be gentle during the grading process. After all, they've been brought up to bubble in the correct circle with a #2 pencil, so to being asked to "produce" something from a variety of information can be tricky. But they'll do just fine.

As students work through the process, they will learn subject-specific skills and cover a few important standards. Yet they'll also be developing those 21st century skills and lifelong traits that we mention throughout this book (a few are listed below).

- **Critical Thinking**
- **Researching**
- **Creativity**
- **Planning**
- **Communication**
- **Collaboration**
- **Leadership**
- **Technological Ability**
- **Social Awareness**
- **Scientific Literacy**
- **Entrepreneurialism**
- **Self-Direction**
- **Internet / Media Literacy**
- **Data Analysis**
- **Personal Expression**
- **Patience / Perseverance**
- **Listening**
- **Healthy Skepticism**
- **Imagination**
- **Flexibility / Adaptability**

It's difficult to put a hard grade on any of those, and it isn't the final goal. If you live by the mantra, *"It's all about the process,"* these skills will indeed be developed. With that said, you do want to provide worthwhile feedback to your students. We use a simple—but sound—rubric to help students "ace the **TEST**" (a clever acronym to help them remember the key steps). The rubric is provided to the right for your convenience.

Photocopy this scoring sheet for your students to review.



How do I get an A?

As you work in teams on this exercise, you will be evaluated to see if you ace the **TEST:**

Thoroughness
Evidence
Strategy
Teamwork

Thoroughness

_____ **The group completed all of the required tasks** (15 points)

_____ **Everyone followed directions throughout the process** (15 points)

Evidence

_____ **The group's final product was logical and could be defended** (15 points)

_____ **A variety of evidence was provided to support the product** (10 points)

Strategy

_____ **The group kept its focus on the requirements of the product** (15 points)

_____ **The group used a sound approach in completing the exercise** (10 points)

Teamwork

_____ **Everyone in the group participated and played a key role** (10 points)

_____ **All members of the group worked well together** (10 points)

Shown above are general areas that your teacher will be evaluating as he or she scores the products you create with your team. You may be provided more details about what it takes to receive the full value in any one of these areas.

Section 4:

"The Social Studies Angle"

Teacher Instruction Sheet

The Main Problem Scenario:

You are an economic advisor who has been asked to decide on the future of the penny. Do we need the one-cent coin, or is it time to get rid of it?

The "Social Studies Angle":

Does the penny serve an important economic purpose in our monetary system?

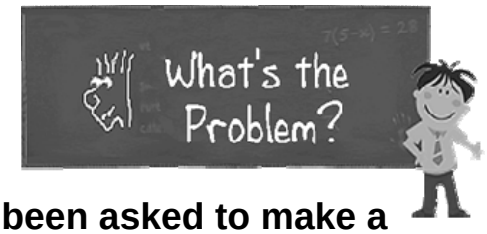
The SOCIAL STUDIES ANGLE

*Your **Teacher Instruction** page is shown to the right. A unique Teacher Instructions sheet is created for each "subject angle" of the Main Problem Scenario, and walks through the entire process of viewing the problem from that point-of-view. Everything that is referenced in the Teacher Instructions (student stimulus items, classroom discussion sheets, thought-gathering sheets, rubrics) will be provided as you work through the exercise.*

Make a photocopy of the Teacher Instructions to walk you through the entire "SS angle"

Teacher Instructions:

"The Penny Debate"



Problem Scenario: **You are an economic advisor who has been asked to make a recommendation about the future of the penny. The one-cent coin is the smallest currency we have in circulation (and what you can buy with it goes down every year). It has been argued that it's time to get rid of the penny, while others feel that choice would have a negative impact. What is the correct course of action?**

Your students will be viewing this problem from a **SOCIAL STUDIES** perspective.

Does the penny serve an important economic purpose in our monetary system?

Students will review the economic role of the penny, and also how the public views the coin in general, and decide on the value of the coin from that perspective.

Step 1
Review Stimulus Items

Stimulus item #1 - "Public Sentiment on the Penny" (video)

Stimulus Item #2 - "A Penny's Place in Our Economy" (article)

Stimulus Item #3 - "Keep the Penny or Retire the Penny?" (online forum)

***Students should take notes as they review the Stimulus Items*

Step 2
Classroom Discussion

Lead a **class discussion** about issues related to the topic.
You are being provided a sheet to help you guide the classroom discussion.

Extended Response: Have students answer the following questions. Remind students to use information from the Stimulus Items to support their response.

1) **At a value of one-cent, how does the penny fit into our economic system? What would happen if it were removed?**

2) **What would be the public reaction if the penny was discarded? Should public sentiment be a factor when deciding whether or not to keep the penny?**

Step 3
Student Response

****students should have access to their notes as they enter their answers*

****students may also have access to the Stimulus Items as they enter their answers*

Product Option: Divide your students into groups, with each group becoming a **Research Team** hired by the federal government. The team has been given the task of **creating a survey** to determine how people factor pennies into their spending habits, and about the overall public sentiment of the coin. The teams must make a list of questions that will provide insight into how people use and feel about the penny. As a class, discuss why certain questions were chosen, and create a "Master List" of the best questions. If the survey was given to a large random sample of the American public, how do you think they would answer? Would an analysis of the survey results be useful when deciding whether to keep or get rid of the penny?

Step 4
Analysis

Rubrics to grade student entries have been provided, and all questions have been mapped to the content standards.

Social Studies Standards

The SOCIAL STUDIES ANGLE

As students work through this section of our Problem-Based Scenario, they'll be focusing on several social studies content areas. This includes:

Student Handout

- **Economics (our monetary system)**
- **Politics & Public Opinion**

In addition—and perhaps more importantly—students will need to understand basic principles of social studies, which is a key benefit of Problem-Based Learning. This means that in addition to the basic disciplinary standards, students will become familiar with the broader themes of social studies. For example:

- **Culture and Cultural Diversity**
- **Time, Continuity, and Change**
- **People, Places, and Environments**
- **Individual Development and Identity**
- **Individuals, Groups, and Institutions**
- **Power, Authority, and Governance**
- **Production, Distribution, and Consumption ***
- **Science, Technology, and Society ***
- **Global Connections**
- **Civic Ideals and Practices ***

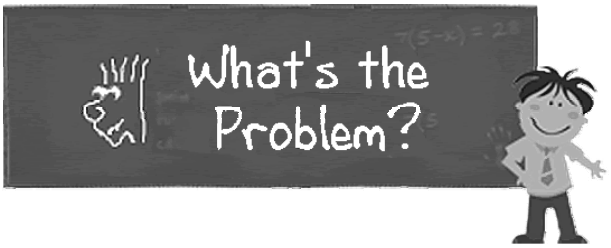
**an asterisk has been placed beside each theme that is a major part of this PBL exercise*

You may want to share the themes listed above with your students prior to beginning the exercise, but the best part is that they'll be developing this broader understanding whether they realize it or not!

The most important thing to remember when introducing the Problem-Based Scenario is to grab student interest right away. It is a fun and challenging exercise, and you certainly want students to approach it that way.

To make this easy for you, we have created a handout to introduce the "social studies angle" to your students for this Problem-Based Scenario. This will help them see that they will be looking at the Main Problem Scenario from a specific point-of-view, in this case with a focus on society and historical trends.

Make photocopies of the next page to introduce the "Social Studies Angle" of this Problem-Scenario to your students



Are you ready to tackle the problem?

The Scenario:

You are an economic advisor who has been asked to make a recommendation about the future of the penny. The one-cent coin is the smallest currency we have in circulation (and what you can buy with it goes down every year). It has been argued that it's time to get rid of the penny, while others feel that choice would have a negative impact. What is the correct course of action?

In order to properly respond to a complicated problem like the one above, you must view it from different points-of-view. For example, we will consider the following:

Something to think about:

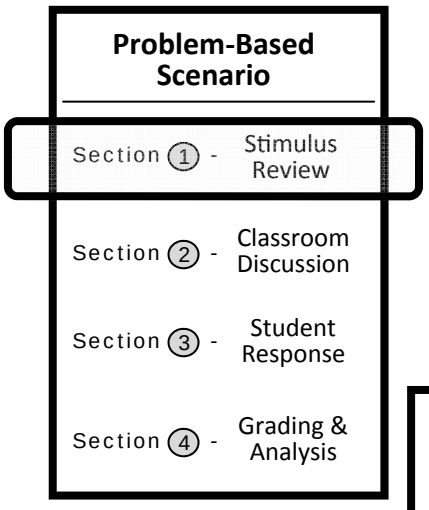
Does the penny serve an important economic purpose in our monetary system?

Prior to giving your response, you will review multiple resources, engage in classroom discussion, and take time to organize your thoughts.

In this exercise, you will review the economic role of the penny, and also how the public views the coin in general, and decide on the value of the coin from that perspective.

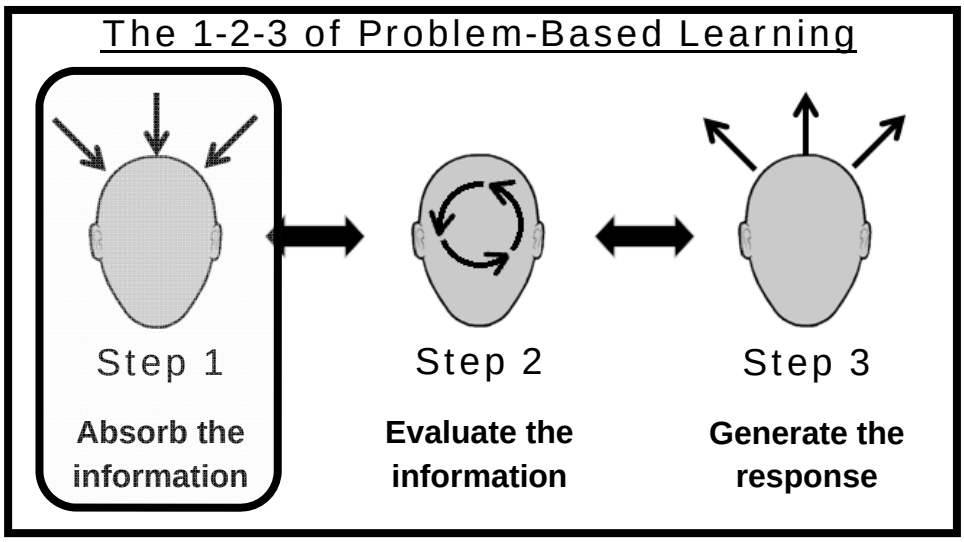
★ *As you work on this exercise, remember that this is primarily a* ***social studies question****. This means that you must consider historical and current trends in our society, along with other political and economic factors, when providing your response.*

Teacher Instruction Sheet



Stimulus Review

The Stimulus Review is Section 1 *on your* ***Teacher Instruction Sheet.***



The SOCIAL STUDIES ANGLE

It's a fancy term, but the "Stimulus Review" is simply the first step in Problem-Based Learning where students review a variety of information surrounding the specific problem or challenge.

In our Problem Scenario, all of the Stimulus Items have been provided for you. We have intentionally gathered a variety of different types and sources. This is important in today's modern world where information comes from all directions, and also sets the stage for Step 2 (Evaluating the Information).

A few examples of the types of Stimulus Items you might see in a Problem-Based Scenario include:

- **Articles**
- **Videos**
- **Infographics**
- **Blogs**
- **Statistics**
- **Lists**
- **Websites**
- **Editorials**
- **Audio Recordings**
- **Cartoons**
- **Primary Sources**
- **Advertisements**

...and much more!

For your convenience, we've placed all of the Stimulus Items for this Problem-Based Scenario on a special website where **both you and your students** can have full access to them. To access these resources, you will go to:

http://www.pblproject.com/students

Login: **penny**
Password: **eb96**

The Stimulus Items you'll see for this section of the exercise include:

Stimulus Item #1

— "Public Sentiment on the Penny" (video)

Stimulus Item #2

— "A Penny's Place in Our Economy" (article)

Stimulus Item #3

— "Keep the Penny or Retire It?" (online forum)

A Few Notes:

There are a few things we'd like to highlight as your students get ready to dive into the Stimulus Items. First, these are actual sources that have been gathered for the topic at hand, even if they have been edited or adapted at times due to length, format, or readability. That means that they don't necessarily reflect our personal opinions, and we certainly don't want to take credit for the hard work of others (all source information will be provided). It does, however, provide a nice mix for your students.

Next, the Stimulus Items should give your students the background information they need to generate their responses to the Problem-Based Scenario. There is no need for you to seek out other resources or for students to do their own research.

With that said, it is always great if there is an opportunity for students to get on a computer or head to the library to find their own background information. Being able to conduct your own research is a vital skill to have, and it is referenced throughout Language Arts standards.

Again, this extra step is not necessary to successfully go through the exercise (we know you're already crunched for time!), but we figured it was worth mentioning!

Teacher Instruction Sheet

Problem-Based Scenario

Section 1 - Stimulus Review

Section 2 - Classroom Discussion

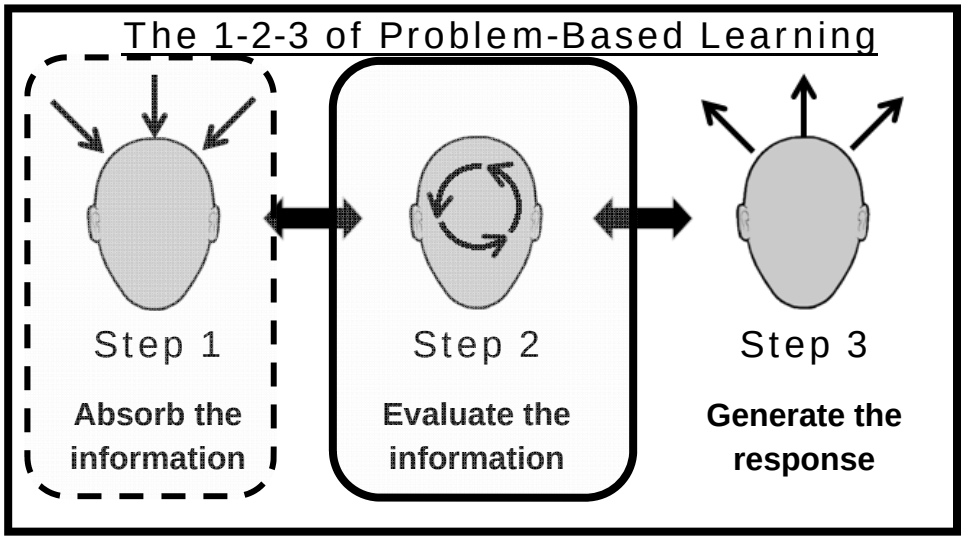
Section 3 - Student Response

Section 4 - Grading & Analysis

Classroom Discussion

The Classroom Discussion is Section 2 *on your* ***Teacher Instruction Sheet.***

Teacher "Quick Sheet"

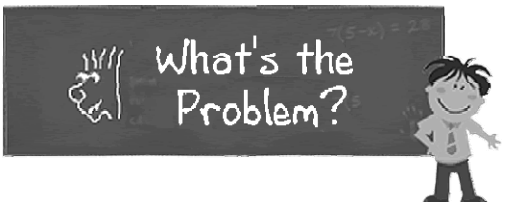


The SOCIAL STUDIES ANGLE

Now that your students have reviewed the Stimulus Items, it is a fitting time to have a **class discussion** about the Problem-Based Scenario (specifically, the "subject angle" that you're working with).

At this stage, there will be a limited amount of new information brought to the table (Step 1), although you might want to introduce ideas not covered in the Stimulus, and perhaps students will share original thoughts and experiences. For the most part, though, the classroom discussion is where you want students to evaluate the information (Step 2) to which they've been exposed. It is now that they will begin to organize it all and decide how it will fit together in their response.

The key to a classroom discussion, of course, is keeping everything focused and moving it in the direction you want, and at the same time creating a free environment for students to share and build on ideas. This is certainly where teachers earn their pay! One way we've tried to help (a little bit, at least) is to provide you with the talking points that work well for this scenario. The bold questions are what you will ask your students, and each has bullet points that you can use to guide the discussion.



Leading Questions for Classroom Discussion

The Penny Debate (social studies angle)

What role does the penny play in our economic system?

- Consider that the face value of the penny is 1 cent, which is based on its purchasing power (the amount that can be purchased with 1 cent actually goes down over time)
- Consider that the penny is used as a marketing tool, with businesses often subtracting a penny from the price (for example, $1.99 instead of $2.00)...getting rid of the penny means that all of these prices will be rounded up to a slight degree
- Consider how pennies do add up over time, and they are actually a major source of income for charities and small donations
- Consider the amount of time the average person wastes looking for a penny at a register to pay, thus holding up a line and wasting everyone else's time

What would be the public reaction if it was announced that the penny was going to be removed from circulation?

- Consider the sentimental value of the "Lincoln Penny," and how people may feel to hear it will soon be gone
- Consider how many people might have greater issues to worry about than whether or not the penny exists
- Consider the major economic issues of the time, and whether or not most people feel that the "penny debate" should be among them

In the end, is it really worth it to get rid of the penny?

- Consider that when all variables are considered, it is very difficult to see if the penny costs more to mint than it's value (especially when you consider that a single penny stays in circulation for more than 30 years and is used multiple times)
- Consider the logistical effort to remove the coin from circulation (billions of pennies are already out there, and would have to be removed by banks and other sources)
- Consider that even if most people are okay with removing the penny, there are some who would support the coin and would voice those opinions strongly (and loudly)
- Consider that there is currently no major public support to get rid of the penny (according to major polls), even if people believe there are cost benefits… on the other hand, that means that people probably wouldn't care much if it was removed

Teacher Instruction Sheet

Problem-Based Scenario

Section 1 - Stimulus Review

Section 2 - Classroom Discussion

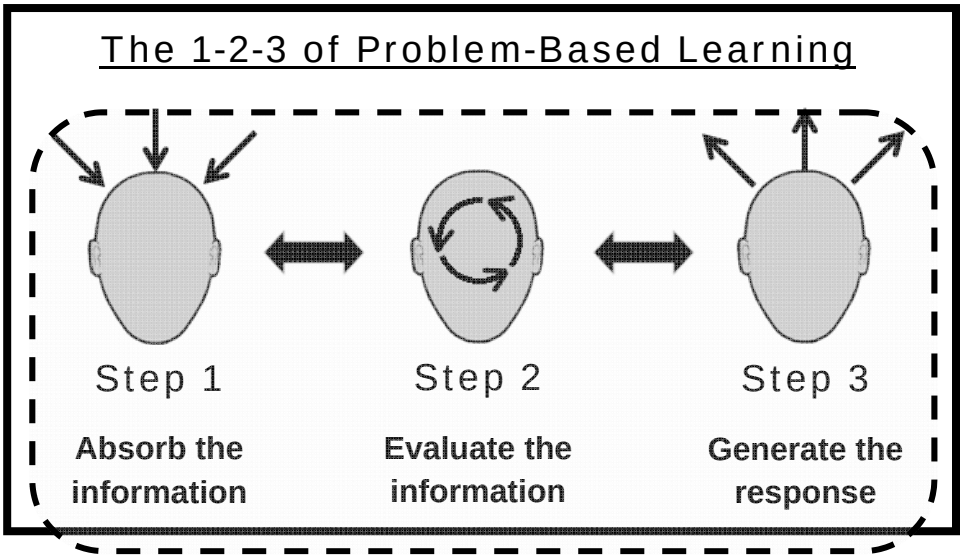
Section 3 - Student Response

Section 4 - Grading & Analysis

"Thought-Gathering" Sheet

The "Thought-Gathering" Sheet is an interim step prior to the student responses.

Student Handout



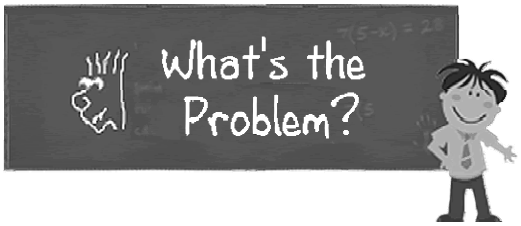
The SOCIAL STUDIES ANGLE

So, by this point, you've had students review Stimulus Items related to the Problem Scenario. That led to a stimulating (we hope) classroom discussion on the topic.

Often times, there is a feeling of "information overload" at this stage. Students have enough information to generate their constructed responses and/or fulfill their product options (we'll talk about these on the upcoming pages), but their thoughts may be all over the place. They may still have to pick their position, refine their arguments, focus their proposal, perfect their design… and so on.

That's where the **"Thought-Gathering" Sheet** comes in. This isn't to be confused with any "note-taking sheets" your students may have written while they were looking through the Stimulus Items or listening to the discussion. Rather, this is a final stage where they sort everything (including their own notes) to prepare for their response. It is a chance to tie together Step 1, Step 2, and Step 3 (shown above).

We have provided a "Thought-Gathering" sheet that works with this exercise and is a good chance for students to organize their ideas prior to creating their responses.



Penny Debate

"Thought-Gathering" Sheet

"A Penny For Your Thoughts"

Would eliminating the penny help the economy?	**Is paying 99 cents more appealing to buyers than paying a dollar?**
How does the general public feel about the penny?	**Are there any historical reasons to keep (or get rid of) the penny?**

Teacher Instruction Sheet

Problem-Based Scenario

Section 1 - Stimulus Review

Section 2 - Classroom Discussion

Section 3 - Student Response

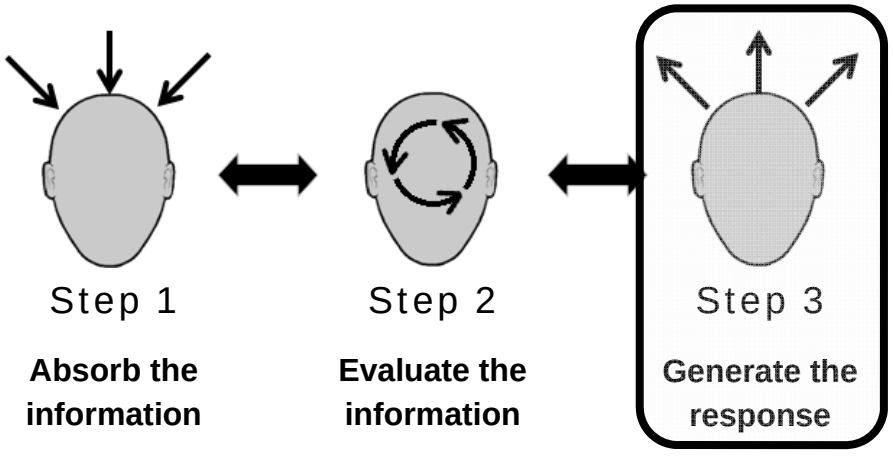
Section 4 - Grading & Analysis

Student Responses
(Extended Response)

The Student Responses are Section 3 *on your* ***Teacher Instruction Sheet.***

Student Handout

The 1-2-3 of Problem-Based Learning



The SOCIAL STUDIES ANGLE

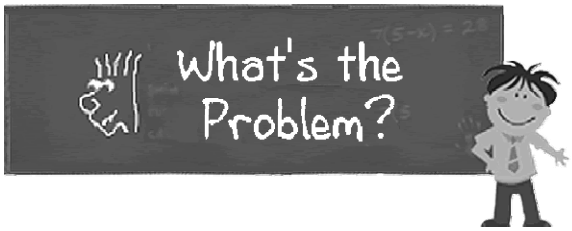
On your Teacher Instruction sheet, you'll see that each scenario provides two types of response options for your students—Extended Responses and the Product Option. Let's look at the **"Extended Responses"** first.

As you would expect, the Extended Responses are simply questions centering around the Problem-Based Scenario that the students answer through their writing.

Most likely, the Extended Responses are similar to what you might see during a Performance Task of a comprehensive assessment (where students are given a range of information to review, and then must give their conclusions based on the evidence). The "test prep" benefits alone make it worthwhile for students to complete the Extended Responses, but the broader benefit is their ability to take the information they've been exposed to and generate a logical response to a problem scenario.

The rubric and process for grading Extended Responses is on the following pages. Also, we will leave it up to you whether you want to allow students to use notes they have taken throughout (we think it's fine for them to do so), and also how strict you want to be with time limits (a half hour or so should be fine).

Here are the Extended Response questions for this scenario.



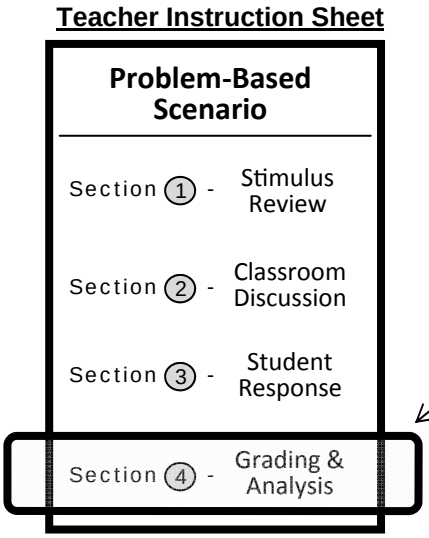
What do you think?

The questions below are centered around the Problem-Based Scenario you've been reviewing. Please answer the questions on separate sheets of paper.

1) **At a value of one-cent, how does the penny fit into our economic system? What would happen if it were removed?**

2) **What would be the public reaction if the penny was discarded? Should public sentiment be a factor when deciding whether or not to keep the penny?**

★ *Remember to support your answers with evidence that you've gathered from what you've read and discussed in class!*



Grading Rubric
(Extended Responses)

The Grading Rubric is Section 3 *on your* ***Teacher Instruction Sheet.***

Student Handout

The SOCIAL STUDIES ANGLE

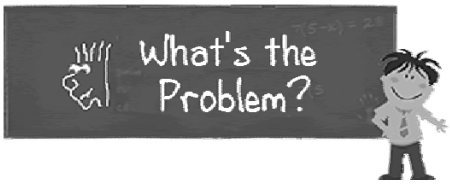
One thing that your students must understand about these Problem-Based Scenarios is that the answer is never "yes" or "no". Instead, students must think their way through the muddy waters of different situations and challenges, while you guide them along the journey.

Of course, the end result needs to be more than a pat on the back—and that's why proper grading is so important. While students may feel that grades exist only to cause stress and fill the blank spaces on a report card, the broader reason is that when students are graded in a clear and fair way, it enables them to continually improve their approach and response.

The Extended Responses for this scenario can be graded using the rubric to the right. It is divided into four sections:

1) Social Studies Content (*What do you want students to bring to the table based on previous lessons?)*
2) Writing Focus *(Was it clear what point the students were trying to make?)*
3) Use of Evidence *(Did the students back up their position with evidence, quotes, statistics, and facts?)*
4) Language & Conventions (*Did students limit mistakes and respond in a thorough and professional manner?)*

Here is a copy of the rubric for your students to review.



How do I get an A?

Listed below are the four different areas that will be evaluated as your responses are graded. Be sure to consider each area as you write.

Rubric Section #1: Social Studies Content – you must show a high level of background knowledge and general understanding of the topic

**in other words: *What are you bringing to the table based on previous lessons?*

4	3	2	1	NS
You proved throughout your response to have a high level of background knowledge of the subject.	**You showed a reasonable level of background knowledge through most of your response.**	**You showed a limited level of background knowledge, and only in certain parts of your response.**	**You showed barely any background knowledge of the subject throughout your response.**	**Your response was incoherent, off-topic, or unable to be read.**

Rubric Section #2: Production & Distribution of Writing – you must organize and sustain your writing based on a defined purpose

**in other words: *Was it clear what point you were trying to make, and did you focus on that point?*

4	3	2	1	NS
Your response had a defined purpose, and it was organized with a clear focus on that purpose.	**Your response had a defined purpose, although it lacked organization and a clear focus on that purpose.**	**The purpose of your response was a bit vague, and there was limited organization and focus.**	**There was no defined purpose or organization to your response.**	**Your response was incoherent, off-topic, or unable to be read.**

Rubric Section #3: Integration of Knowledge and Ideas (use of "evidence") – you must support your arguments and positions with outside information (i.e. "stimulus items")

**in other words: *Did you back up your position with evidence, quotes, statistics, and facts?*

4	3	2	1	NS
You provided convincing support/evidence for your main idea and included appropriate sources, facts, & details.	**You provided adequate support/evidence for your main idea and only limited sources, facts, & details.**	**You provided only modest support/ evidence for your main idea and it was not strengthened by sources, facts, & details.**	**You provided almost no support/evidence for your main idea.**	**Your response was incoherent, off-topic, or unable to be read.**

Rubric Section #4: Language & Conventions – you must use proper grammar, spelling, vocabulary, and other conventions of the English language

**in other words: *Did you limit mistakes and respond in a thorough and professional manner?*

4	3	2	1	NS
Your response was professional and you demonstrated a command of language	**Your response was mostly professional with limited errors related to language conventions.**	**Your response was rather sloppy with multiple errors related to language**	**Your response was completely sloppy and showed no effort to follow language**	**Your response was incoherent, off-topic, or unable to be read.**

Teacher Instruction Sheet

Problem-Based Scenario

Section 1 - Stimulus Review

Section 2 - Classroom Discussion

Section 3 - Student Response

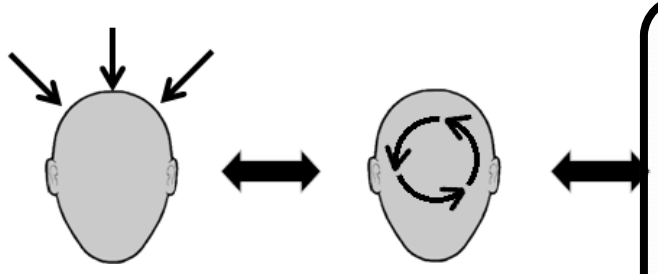
Section 4 - Grading & Analysis

Student Responses
("Product Option")

The Student Responses are Section 3 *on your* ***Teacher Instruction Sheet.***

Student Handout

The 1-2-3 of Problem-Based Learning



Step 1	Step 2	Step 3
Absorb the information	**Evaluate the information**	**Generate the response**

The SOCIAL STUDIES ANGLE

It all leads up to this—***"The Product Option."*** It is here that students will have the "thinking muscle" truly stretched and those 21st Century Skills (collaboration, communication, technology, and so on) will be finely tuned.

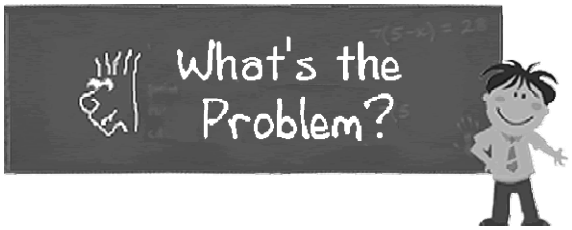
Let's start with a very simple definition:

The Product Option – where students are asked to "produce" something

Yes, this is very broad, and could include any of the following (and so much more):

Bulletin Board	Advertisement	Chart	Role Play	Tips / Suggestions
Letter	Cartoon	Pop-up / Child Book	Commercial	Slogan / Motto
Comic Strip	Play	Collage	Riddles / Jokes	Marketing Plan
Movie Trailer	Poster / Artwork	Timeline	Graphic Organizer	Jingle
Demonstration	Political Cartoon	Prototype	Brochure	Campaign Platform
Diary Entry	Costume	Crossword Puzzle	Poem	Experiment
Editorial Essay	Newspaper Article	Database / Spreadsheet	Rap Song	Mosaic
Map	Diorama	Oral Report	Webpage	Argument
Lesson Plan	Display	Rebus Story	Instruction Manual	Proposal
Fiction Story	Mock Interview	Slide Show	Petition	Illustrated Story
Interview	Survey	Recipe / Instructions	Game	Radio show

After you divide your students into teams, photocopy the next page to outline the Product Option for this scenario.



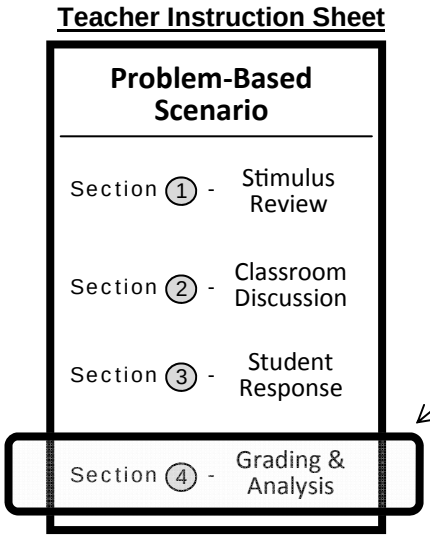
The task at hand...

Working to produce something as a team can help you gain a better understanding of the problem-scenario. Please work together on the exercise below:

Your group is a **Research Team** that has been hired by the federal government. You have been given the task of **creating a survey** to determine how people factor pennies into their spending habits, and how people feel about pennies in general.

Your team must make a list of questions that will provide insight into how people use and feel about the penny. As a class, you will review the different survey questions created by each team, and discuss why those questions were chosen. The class will then create a "Master List" of the best questions.

If the survey was given to a large random sample of the American public, how do you think they would answer? Would an analysis of the survey results be useful when deciding whether to keep or get rid of the penny?



Grading Rubric
(Product Option)

The Grading Rubric is Section 3 *on your* ***Teacher Instruction Sheet.***

Student Handout

We mention this time and time again through this book, and it's worth saying another time:

It's all about the process.

The purpose of these exercises is to allow students to think through problems and situations, and it's the teacher's role to guide them through the journey.

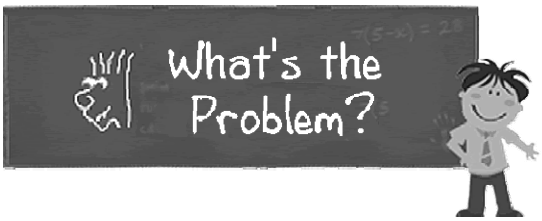
Without a doubt, your students will remind you that "it's all about the process" when they try to convince you to be gentle during the grading process. After all, they've been brought up to bubble in the correct circle with a #2 pencil, so being asked to "produce" something from a variety of information can be tricky. But they'll do just fine.

As students work through the process, they will learn subject-specific skills and cover a few important standards. Yet they'll also be developing those 21st century skills and lifelong traits that we mention throughout this book (a few are listed below).

- **Critical Thinking**
- **Researching**
- **Creativity**
- **Planning**
- **Communication**
- **Collaboration**
- **Leadership**
- **Technological Ability**
- **Social Awareness**
- **Scientific Literacy**
- **Entrepreneurialism**
- **Self-Direction**
- **Internet / Media Literacy**
- **Data Analysis**
- **Personal Expression**
- **Patience / Perseverance**
- **Listening**
- **Healthy Skepticism**
- **Imagination**
- **Flexibility / Adaptability**

It's difficult to put a hard grade on any of those, and it isn't the final goal. If you live by the mantra, "*It's all about the process,*" these skills will indeed be developed. With that said, you do want to provide worthwhile feedback to your students. We use a simple—but sound—rubric to help students "ace the **TEST**" (a clever acronym to help them remember the key steps). The rubric is provided to the right for your convenience.

Photocopy this scoring sheet for your students to review.



How do I get an A?

As you work in teams on this exercise, you will be evaluated to see if you ace the **TEST:**

Thoroughness
Evidence
Strategy
Teamwork

Thoroughness

_____ **The group completed all of the required tasks** (15 points)

_____ **Everyone followed directions throughout the process** (15 points)

Evidence

_____ **The group's final product was logical and could be defended** (15 points)

_____ **A variety of evidence was provided to support the product** (10 points)

Strategy

_____ **The group kept its focus on the requirements of the product** (15 points)

_____ **The group used a sound approach in completing the exercise** (10 points)

Teamwork

_____ **Everyone in the group participated and played a key role** (10 points)

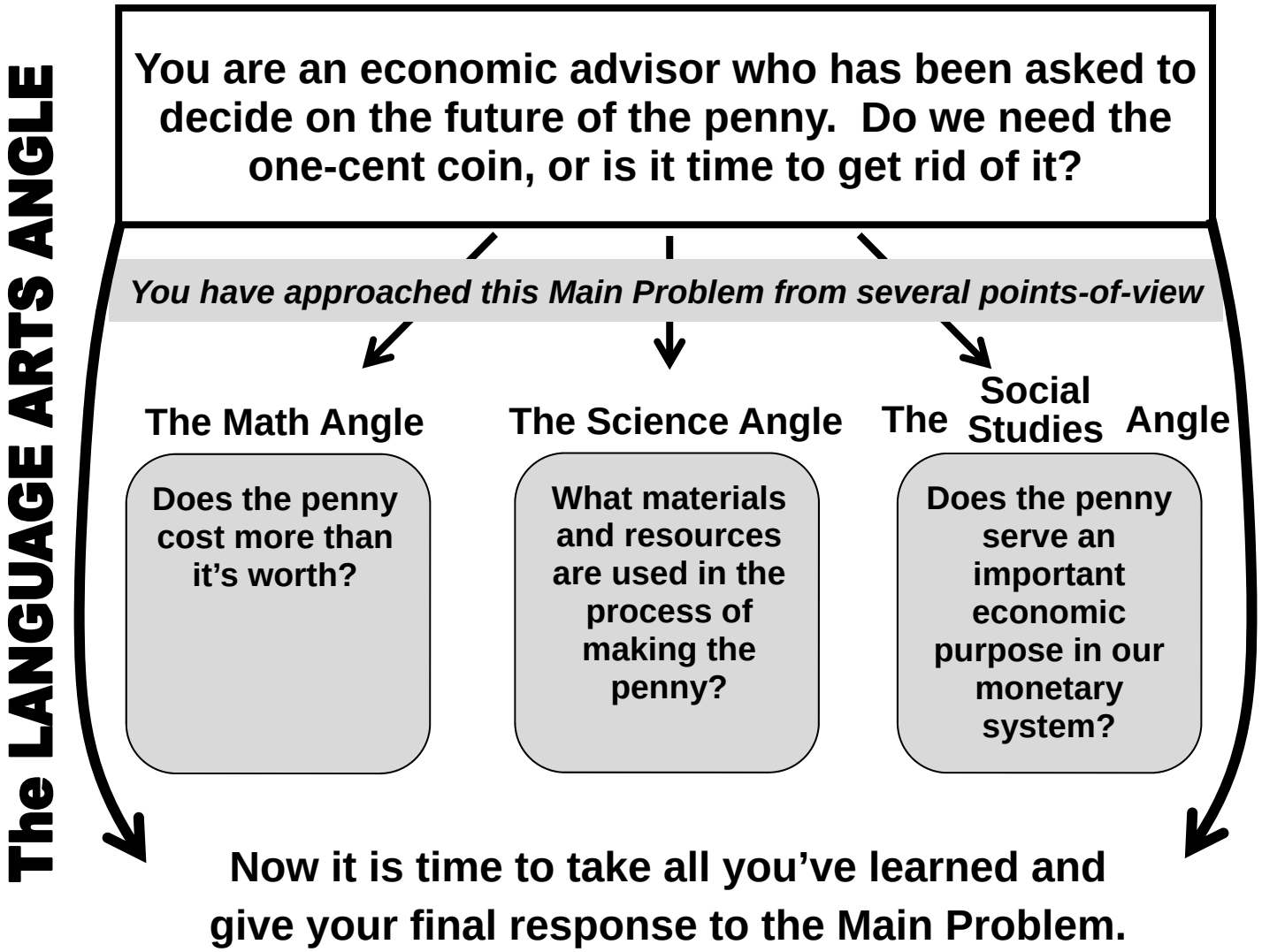
_____ **All members of the group worked well together** (10 points)

Shown above are general areas that your teacher will be evaluating as he or she scores the products you create with your team. You may be provided more details about what it takes to receive the full value in any one of these areas.

Section 5:

"The Language Arts Angle"

The Main Problem Scenario:



Now it is time to take all you've learned and give your final response to the Main Problem.

★ *Language Arts serves as the hub for the entire exercise. It is in ELA that all of the other "subject angles" are evaluated and measured against one another, and a final decision about how to approach the Main Problem Scenario is made based on all of the available information.*

Throughout this book, we've been examining the Main Problem Scenario from multiple "subject angles." Well, now it's time to bring it all together. Everything that your students have been exposed to thus far is fair game in the Language Arts section. That means that they can pull from all **classroom discussion sessions, notes and "Thought-Gathering" Sheets**, and of course the **Stimulus Items** that provide information about the Main Problem.

For your convenience, we've placed all of the Stimulus Items for this Problem-Based Scenario on a special website where **both you and your students** can review them. To access these resources, you will go to:

http://www.pblproject.com/students

Login: **penny**
Password: **eb96**

The "Math Angle"

Stimulus Item #1 — "What does a penny cost?" (video)

Stimulus Item #2 — "Value of a Penny" (statistics)

Stimulus Item #3— "Making U.S. Currency" (infographic)

The "Science Angle"

Stimulus Item #1 — "Minting Process Revealed" (list of steps)

Stimulus Item #2 — "The Environmental Impact of the Penny" (article)

Stimulus Item #3 — "Making the Penny Better" (editorial)

The "Social Studies Angle"

Stimulus item #1 - "Public Sentiment on the Penny" (video)

Stimulus Item #2 - "A Penny's Place in Our Economy" (article)

Stimulus Item #3 - "Keep the Penny or Retire the Penny?" (online forum)

Student Responses
Language Arts

In previous sections of this book, students have only concentrated on one piece of the puzzle. Now they will look at the Main Problem Scenario as a whole, incorporating everything that has been researched and discussed along the way.

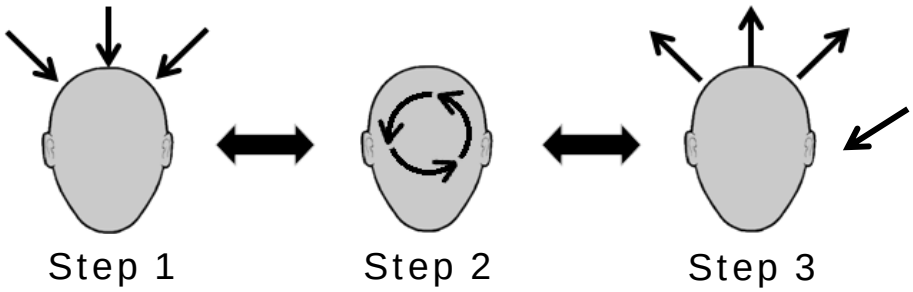
To respond to the Main Problem, a prompt has been provided (shown to the right). Your students' writing—and perhaps oral presentations—will need to meet several expectations from a Language Arts perspective. Students must:

The LANGUAGE ARTS ANGLE

- **Show the ability to comprehend informative texts and resources**
- **Explain their position and overall reasoning**
- **Support their positions with evidence from their research**
- **Articulate clear opinions *(stressed at the elementary level)***
  Form compelling arguments *(stressed at the middle school level)*
- **Demonstrate speaking and listening skills**

The skills above will only be demonstrated if students are able to absorb the Stimulus Items, organize their thoughts, and approach the Problem Scenario in a logical way. If they fail in these tasks before a single word is written on paper, they'll never be able "write their way out of it" at this stage of the game. To put it another way:

The 1-2-3 of Problem-Based Learning



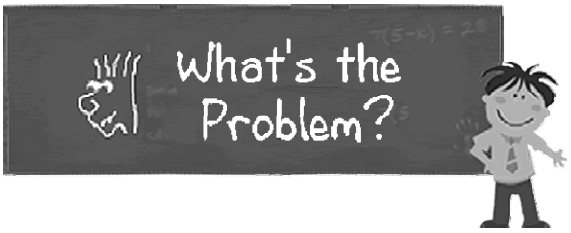
Step 1 — **Absorb the information**

Step 2 — **Evaluate the information**

Step 3 — **Generate the response**

This is not merely a writing exercise! Student responses will never satisfy all of the requirements listed above if Steps 1 and Steps 2 are incomplete.

Here is the Language Arts prompt for this Problem Scenario.



What do you think?

The prompt below is centered around the Problem Scenario you've been reviewing. Please provide your response on a separate sheet of paper.

A State Senator has asked for your opinion on the "Penny Debate," which is an argument over whether to keep the coin or get rid of it.

Write a recommendation to the Senator either in favor of keeping the penny, or discontinuing its use. You must explain the reasons for your viewpoint, and support it with evidence and sound reasoning.

Grading Rubric
(Language Arts)

Student Handout

The LANGUAGE ARTS ANGLE

One thing that your students must understand about these Problem-Based Scenarios is that the answer is never "yes" or "no". Instead, students must think their way through the muddy waters of different situations and challenges, while you guide them along the journey.

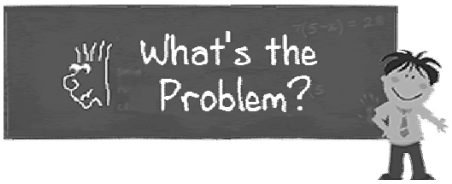
Of course, the end result needs to be more than a pat on the back—and that's why proper grading is so important. While students may feel that grades exist only to cause stress and fill the blank spaces on a report card, the broader reason is that when students are graded in a clear and fair way, it enables them to continually improve their approach and response.

In many ways, the Language Arts prompt is more difficult than the others because students aren't being asked to stay within the boundaries of math, science, or social studies. Instead, they are given the green light, free to use the research from all other subjects (and anything else they want to bring to the table) to form their response. This may sound easier, but the truth is that the ability to organize information and pull out key evidence (a tricky task for students) becomes more critical and more difficult at this stage. Let's see how they do!

The writing prompt for the Problem Scenario can be graded using the rubric to the right. It is divided into four sections:

1) Logical Approach (*Did students use a reasonable strategy to deal with the Main Problem?)*
2) Writing Focus *(Was it clear what point the students were trying to make?)*
3) Use of Evidence *(Did the students back up their position with evidence, quotes, and facts?)*
4) Language & Conventions (*Did students limit mistakes and respond in a thorough and professional manner?)*

Here is a copy of the rubric for your students to review.



How do I get an A?

Listed below are the four different areas that will be evaluated as your responses are graded. Be sure to consider each area as you write.

Rubric Section #1: Logical Approach – you must show that a thoughtful and sound process was used to solve the Main Problem.

**in other words: *Did you use a reasonable strategy to deal with the Main Problem?*

4	3	2	1	NS
You proved throughout your response that your approach to the problem was reasonable and consistent.	**You showed that your approach to the problem was generally reasonable, although a bit inconsistent**	**You showed there was limited reasoning or consistency in your approach to the problem**	**You showed barely any reasonable or consistent approach to dealing with the problem**	**Your response was incoherent, off-topic, or unable to be read.**

Rubric Section #2: Production & Distribution of Writing – you must organize and sustain your writing based on a defined purpose

**in other words: *Was it clear what point you were trying to make, and did you focus on that point?*

4	3	2	1	NS
Your response had a defined purpose, and it was organized with a clear focus on that purpose.	**Your response had a defined purpose, although it lacked organization and a clear focus on that purpose.**	**The purpose of your response was a bit vague, and there was limited organization and focus.**	**There was no defined purpose or organization to your response.**	**Your response was incoherent, off-topic, or unable to be read.**

Rubric Section #3: Integration of Knowledge and Ideas (use of "evidence") – you must support your arguments and positions with outside information (i.e. "stimulus items")

**in other words: *Did you back up your position with evidence, quotes, statistics, and facts?*

4	3	2	1	NS
You provided convincing support/evidence for your main idea and included appropriate sources, facts, & details.	**You provided adequate support/evidence for your main idea and only limited sources, facts, & details.**	**You provided only modest support/ evidence for your main idea and it was not strengthened by sources, facts, & details.**	**You provided almost no support/evidence for your main idea.**	**Your response was incoherent, off-topic, or unable to be read.**

Rubric Section #4: Language & Conventions – you must use proper grammar, spelling, vocabulary, and other conventions of the English language

**in other words: *Did you limit mistakes and respond in a thorough and professional manner?*

4	3	2	1	NS
Your response was professional and you demonstrated a command of language conventions.	**Your response was mostly professional with limited errors related to language conventions.**	**Your response was rather sloppy with multiple errors related to language conventions.**	**Your response was completely sloppy and showed no effort to follow language conventions.**	**Your response was incoherent, off-topic, or unable to be read.**

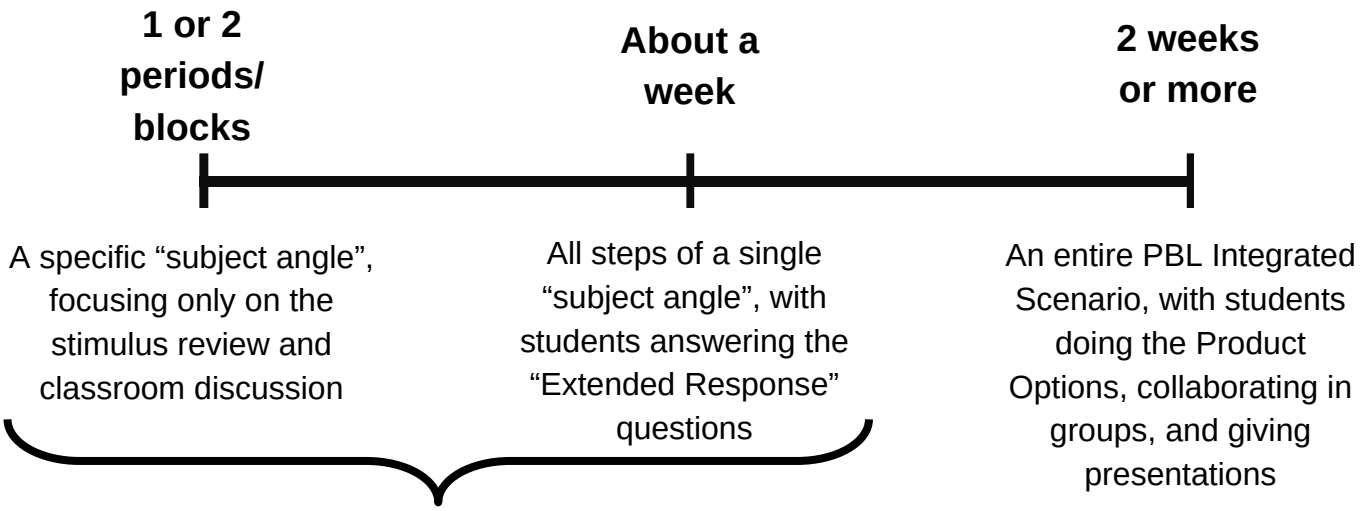
How long will it take?

Student Handout

Without a doubt, the most common question we are asked is:

"How long is this going to take?"

Our answer is, ***"It's up to you"*** (which could be seen as dodging the question). The truth is that it's all about options and flexibility. Obviously, the time will greatly vary if you just do a "subject-specific problem" (i.e. one section of this book) or do the entire integrated Problem Scenario (i.e. the whole book). Consider these guidelines:



If you're crunched for time, you may concentrate on one section of this book (the "subject angle"), and probably won't be able to dive into the Product Option. Still, this will be a great introduction into Problem-Based Learning for your students.

It will certainly take a week or more to go through this whole book, including the Product Options and presentations for each subject angle (i.e. everything in this book)

In the end, if you can take a Problem Scenario all of the way from beginning to end, including each "subject angle", as well as the products, group work, and presentations that go with each one, your students will have accomplished quite a bit. For that reason, we have included a **"Certificate of Accomplishment"** that you may want to provide to show students that their efforts are appreciated. Remember, you want them to enjoy the whole experience!

Photocopy this certificate to give to your students.

Certificate

of

ACHIEVEMENT

Awarded to

_____

for completion of the following:

Problem-Based Scenario — *"The Penny Debate"*

By completing this entire scenario, you have demonstrated that you have the ability to approach a real-world problem, learn about it through a variety of different sources, evaluate all of the information, and provide a clear and logical response to the challenge.

Given this date _____ ***in the year*** _____

Signed _____

Great Job!

Just so you know...

The PBL Project website

www.pblproject.com

The Problem-Based Scenario covered in this book—and dozens more—are available to those schools and districts who have access to the PBL Project website.

To request a temporary password (or purchase a license online), please go to:

www.pblproject.com

$399 for a site license for a full school year
(includes all teachers, grade levels, and subject areas)

For more information (or to purchase a license over the phone), contact:

Ben Bache, PBL Project manager
(864)-877-5123
ben@pblproject.com

The PBL Project website:

1) Provides a wide variety of **Integrated Problem Scenarios** based on real-life situations that are engaging to students

2) Approaches each problem from multiple points-of-view across **all core subject areas**

3) Provides **a range of stimulus items** appropriate to each problem (articles, videos, infographics, statistics, etc.)

4) Includes **leading questions for classroom discussion** to help students further explore the topic

5) Guides students through the **"information-gathering"** process

6) Gives students an **online platform to enter responses** (proposals, arguments, presentations, etc.)

7) Enables teachers to **view, grade, and analyze student responses**

8) Gives teachers the ability to **create their own Problem-Based scenarios**, including the uploading of all resources and assigning of student responses

9) Includes **Problem-Based "Weekly Warm-ups"** based on current events and engaging topics

10) Features **pre-made tests** for Math and ELA, complete with **"technology enhanced" items**

For a temporary password, simply text your e-mail address to **6468-TRY-PBL** (646-887-9725)

Additional Features of the

The PBL Project website

www.pblproject.com

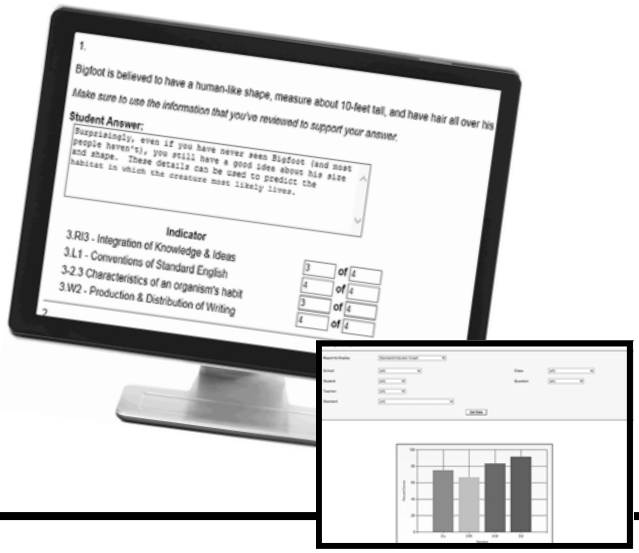
In addition to the Integrated Problem-Based Scenarios (like the one covered in this book), access to the PBL Project website will also give you:

Problem-Based "Weekly Warm-ups" that center around current events

---

Options for students to submit their Extended Responses online

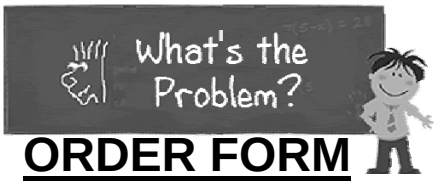
(and for teachers to grade and analyze those responses)



Hundreds of Critical Thinking Exercises and Creativity Drills for all grade levels and core subject areas

"Technology-Enhanced" exams aligned to the Math & ELA standards

For a temporary password, simply text your e-mail address to **6468-TRY-PBL** (646-887-9725)



ORDER FORM

THE PBL PROJECT

Problem-Based Learning. Done Right. Finally.

www.pblproject.com

Early Elementary

The Baseball Field
You would like to turn an empty lot into a baseball field that can be used by the community. What are the issues involved and is this a good idea?

Number of copies = _____

The Butterfly Garden
You are a gardener who is working with the school to build a butterfly garden. How are you going to do this?

Number of copies = _____

The Field Trip
You want to convince your teacher to take the class on a field trip to learn about local history. Where will you go, and what do you need to consider?

Number of copies = _____

The Class Mascot
You are in charge of choosing a mascot that best represents your class. What needs to be considered, and what is the best choice for the new mascot?

Number of copies = _____

Outside Recess
You are a teacher whose class wants to extend recess time, but there are concerns about the extra exposure to the sun. How can you protect students from this risk?

Number of copies = _____

FULL PACKET for EARLY ELEMENTARY
(includes all 5 books)

Number of packets = _____

Upper Elementary

Bigfoot
You are the mayor of a small town where there has been a rise of Bigfoot sightings in a nearby wooded region. Can these rumors be true?

Number of copies = _____

Print vs. Online Magazines
You are the owner of a magazine publishing company. Should you publish your magazines online, or continue to print and deliver them to your customers' doors?

Number of copies = _____

The Road Trip
You want to convince your parents to go on a cross-country road trip. What is required to make the trip a successful one?

Number of copies = _____

The School Day
You are a member of a school board that wants to improve classroom instruction by lengthening the school day. Is this something you will support?

Number of copies = _____

The TV Lineup
You help run a major television network and must decide on the new lineup of TV shows for the upcoming season. What shows will you choose to please your audience?

Number of copies = _____

FULL PACKET for UPPER ELEMENTARY
(includes all 5 books)

Number of packets = _____

Middle School / Secondary

Background Music
You are principal at a school that is considering playing background music while students work. Is this a good idea, and what are the issues involved?

Number of copies = _____

The Football Program
You are a school board member in a district that is considering the option of eliminating high school football. What is the correct course of action?

Number of copies = _____

Genetically Modified Organisms (GMOs)
You are the head of an organization that supports local farmers, and GMOs are a major concern. What should be your group's position on this issue?

Number of copies = _____

The Penny Debate
You are an economic advisor who has been asked to decide on the future of the penny. Do we need the one-cent coin, or is it time to get rid of it?

Number of copies = _____

The Next Big Thing
You are an investor who is willing to devote time, energy, and money to the "Next Big Thing." What is that innovation going to be?

Number of copies = _____

FULL PACKET for MIDDLE SCHOOL
(includes all 5 books)

Number of packets = _____

---

1 copy = $29.95 x _____ total copies = $_____

1 packet = $119.00 x _____ total packets = $_____

(a packet includes all 5 books for a specific grade band)

+ 8% Shipping = $_____

TOTAL: = $_____

If sending this order form with a check, please provide the address where you would like materials to be shipped:

_____

_____

_____

Please fax purchase orders to (864)-877-5123

Or send P.O. or this form w/ a check to:

Homecourt Publishers
2435 East North St., #245
Greenville, SC 29615-1442

For more information, contact: **Ben Bache, managing editor**
(864) 877-5123
ben@pblproject.com