Integrated Problem Scenarios
Middle School / Secondary

The Scenario:

“Genetically Modified Organisms”

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

* Features engaging and real-world scenarios
* Integrates all core subjects
* Includes all teacher and student resources
* Provides a full overview of Problem-Based Learning
You are the head of an organization that supports local farmers, and Genetically Modified Organisms (GMOs) are a major concern. What should be your group’s position on this issue?

You will approach this Main Problem from several points-of-view

The Math Angle
Is the amount of food being grown enough to feed the population?

The Science Angle
What is the science behind GMOs, and what are the potential results?

The Social Studies Angle
Why are GMOs controversial, and how is the public reacting to scientific changes in agriculture?

In the end, you will 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 is made based on all of the available information.
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
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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’s no wrong answer.”
The truth: A Problem-Based scenario will not have a single, “correct” answer. However, a response considered illogical 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.
The Main Problem:

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

You are the head of a professional organization that supports local farmers. You are aware that Genetically Modified Organisms (GMOs) are a heavily debated topic within agriculture and throughout your community. You want to do what is best for the farmers you represent and for the public in general. What are the issues involved with GMOs, and what is the best position for your organization?

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 one approach.

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

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:**

Is the amount of food being grown enough to feed the population?

*Students will review data about hunger and food distribution, and decide on the issue of food scarcity from a numbers perspective.*

**The Science Angle:**

What is the science behind GMOs, and why are the potential results?

*Students will review the science behind Genetically Modified Organisms, and decide on the potential (both good and bad) of this new innovation.*

**The Social Studies Angle:**

Why are GMOs controversial, and how is the public reacting to scientific changes in agriculture?

*Students will review the debate over Genetically Modified Organisms and determine what is fueling the controversy and which arguments are the most sound.*

**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.
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 another 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.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

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.
The Scenario:

You are the head of a professional organization that supports local farmers. You are aware that Genetically Modified Organisms (GMOs) are a heavily debated topic within agriculture and throughout your community. You want to do what is best for the farmers you represent and for the public in general. What are the issues involved with GMOs, and what is the best position for your organization?

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:**

Is the amount of food being grown enough to feed the population?

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 data about hunger and food distribution, and decide on the issue of food scarcity from a “numbers” perspective.

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

Stimulus Review

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: GMO
Password: kr67

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

Stimulus Item #1
— “A Look at Hunger” (infographic)

Stimulus Item #2
— “Hunger Stats” (statistics)

Stimulus Item #3
— “The Power of GMOs” (article)

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!
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.
How can simple math and statistics be used to demonstrate how widespread the problem of hunger is?

- Consider data that is important and easy to measure, such as the amount of the hungry people in an area and the supply of food that is available.
- Consider data that is relevant, such as how much food may be wasted or improperly stored, or the amount of farmland that is not being utilized to its full potential.
- Consider that some important data may be very difficult to measure, such as the number of people who have food insecurity for a short time because they are temporarily out of work, and how many people who rely on their church for help.

How is the use of actual numbers and mathematical facts an effective way to convince others of the problem of hunger?

- Consider how calculations about how much food is available compared to the number of hungry people must be made to determine how widespread the problem really is.
- Consider that “hard data” (i.e. actual numbers) can be more convincing and support an argument more than just stories and anecdotes that don’t have any statistical evidence.
- Consider how some data can be “more important” to your cause than other data, so it is important to choose the statistics that best represent your argument and will be most useful in convincing others to take action.

What other methods—aside from simple math—can be used to capture people’s attention about the problem of hunger?

- Consider that sometimes a personal story—or even a picture—can be more effective than statistics in capturing people’s emotions and getting them to take action.
- Consider that slogans and catchy posters or flyers can catch a person’s eye and raise awareness about a subject.
- Consider that the combination of statistics and “hard math” with imagery and stories is the most effective way to garner attention and convince people to take action on a certain cause.

Leading Questions for Classroom Discussion

Genetically Modified Organisms (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 circling 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).
1) How can simple math and statistics be used to highlight the problem of hunger in America? What other methods can be used to get people’s attention?

2) Based on the “numbers”, how much of a problem is hunger and food insecurity in the United States? Should GMOs be used if they can increase the amount of food that is grown? Would other strategies work better?

Remember to support your answers with evidence that you’ve gathered from what you’ve read and discussed in class!
One thing that your students need to understand about these Problem-Based Scenarios is that the answer is never a simple “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.
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 a general understanding of the topic.

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

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<tr>
<td>You provided evidence to show that you have a high level of background knowledge of the topic.</td>
<td>You showed a limited level of background knowledge, and only in certain parts of your response.</td>
<td>You showed no background knowledge of your topic.</td>
<td>Your response was incoherent, off-topic, or unable to be read.</td>
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### 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?

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<tbody>
<tr>
<td>Your response had a defined purpose, and it was clear in your writing.</td>
<td>Your response had a purpose, although it lacked organization and a clear focus on that purpose.</td>
<td>Your response was incoherent, off-topic, or unable to be read.</td>
<td>Your response was incoherent, off-topic, or unable to be read.</td>
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### Rubric Section #3: Integration of Knowledge & 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?

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<tbody>
<tr>
<td>You provided convincing support/evidence for your main idea and included appropriate sources, facts, &amp; details.</td>
<td>You provided adequate support/evidence for your main idea and only limited sources, facts, &amp; details.</td>
<td>You provided only modest support/evidence for your main idea and it was not strengthened by sources, facts, &amp; details.</td>
<td>Your response was incoherent, off-topic, or unable to be read.</td>
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### 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?

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</thead>
<tbody>
<tr>
<td>Your response was professional and you demonstrated a command of language conventions.</td>
<td>Your response was mostly professional with limited errors related to language conventions.</td>
<td>Your response was rather sloppy with multiple errors related to language conventions.</td>
<td>Your response was completely sloppy and showed no effort to follow language conventions.</td>
<td>Your response was incoherent, off-topic, or unable to be read.</td>
<td></td>
</tr>
</tbody>
</table>
As students work through this section of our Problem-Based Scenario, they’ll be focusing on several science content areas. This includes:

- Genetics and variation of traits
- Science, Engineering, & Society

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 hallmark of Problem-Based Learning. This means that students will be:

- 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 Scenario:

You are the head of a professional organization that supports local farmers. You are aware that Genetically Modified Organisms (GMOs) are a heavily debated topic within agriculture and throughout your community. You want to do what is best for the farmers you represent and for the public in general. What are the issues involved with GMOs, and what is the best position for your organization?

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 is the science behind GMOs, and what are the potential results?

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 behind Genetically Modified Organisms, and decide on the potential (both good and bad) of this new innovation.

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!
Stimulus Review

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

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: GMO
Password: kr67

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

Stimulus Item #1
— “GMOs & Agriculture” (article)

Stimulus Item #2
— “GMO Basics” (bullet-point list)

Stimulus Item #3
— “A Scientist’s Take on GMOs” (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!
The “Thought-Gathering” Sheet is an interim step prior to the student responses.

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 where students may 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.
**What Are GMOs?**

---

**Your Thoughts:**

- Examples of GMOs:
- How GMOs can be used:
- Why GMOs are controversial:
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):

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

After you divide your students into teams, photocopy the next page to outline the Product Option for this scenario.
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 **web developers**. Your task is to **design a website** that is intended to provide information about “Genetically Modified Organisms” (GMOs).

The website design can be drawn on paper in a way that a developer would be able to take it and post it on the internet. The homepage should show all links that will be included on the website, with a brief explanation as to what information will be provided when a viewer clicks on each link.

Remember that the goal is simply to provide information about GMOs to the general public, including what they are and how they can be used. There may also be a link on the controversy surrounding them. You will share your designs with the class and vote on the best website design.
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 asking them 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
- 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**:  

<table>
<thead>
<tr>
<th>Thoroughness</th>
<th>Evidence</th>
<th>Strategy</th>
<th>Teamwork</th>
</tr>
</thead>
<tbody>
<tr>
<td>_______ The group completed all of the required tasks (15 points)</td>
<td>_______ The group’s final product was logical and could be defended (15 points)</td>
<td>_______ The group kept its focus on the requirements of the product (15 points)</td>
<td>_______ Everyone in the group participated and played a key role (10 points)</td>
</tr>
<tr>
<td>_______ Everyone followed directions throughout the process (15 points)</td>
<td>_______ A variety of evidence was provided to support the product (10 points)</td>
<td>_______ The group used a sound approach in completing the exercise (10 points)</td>
<td>_______ All members of the group worked well together (10 points)</td>
</tr>
</tbody>
</table>

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.
Social Studies Standards

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

- **Society & Technology**
- **Economics (supply and demand)**

In addition—and perhaps more importantly—students will need to understand basic principles of social studies, which is also a 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.
The Scenario:

You are the head of a professional organization that supports local farmers. You are aware that Genetically Modified Organisms (GMOs) are a heavily debated topic in agriculture and throughout your community. You want to do what is best for the farmers you represent and for the public in general. What are the issues involved with GMOs, and what is the best position for your organization?

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:**

**Why are GMOs controversial, and how is the public reacting to scientific changes in agriculture?**

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 debate over Genetically Modified Organisms and determine what is fueling the controversy and which arguments are the most sound.

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

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: GMO
Password: kr67

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

Stimulus Item #1
— “Welcome to a New World...” (article)

Stimulus Item #2
— Searching for ‘GMO’ (search engine results)

Stimulus Item #3
— “Should we allow GMOs?” (online discussion)

**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!
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.
What is the public sentiment towards GMOs?
- Consider that genetically modified foods are very common in grocery stores, and the majority of people do not protest the practice… however, there is a large group of critics and they often have the strongest (and loudest) opinions
- Consider that, by definition, “Genetically Modified Organisms” have been modified from their natural state by human engineering… many critics compare this to “playing God” and have a problem with the practice
- Consider that many people believe that there are health risks to eating food that has been genetically modified… even if science doesn’t support this to a large degree, it is impossible to completely rule out and public opinion is difficult to change

How much should public opinion be considered when making policies regarding the use of GMOs?
- Consider that GMOs are used to increase the availability and durability of food… obviously, the amount of food available will play a large role in determining any laws or restrictions concerning GMOs
- Consider that the use of GMOs is as much an economic issue as any other one… if consumers are willing to buy genetically modified foods, farmers will supply them
- Consider that in a democratic system, public opinion always matters a great deal… if people feel strongly enough to elect representatives who are willing to make strict laws concerning GMOs, then there will be changes

What can be done to satisfy both the critics and supporters of GMOs?
- Consider how clear labeling of food packages can make it easy for critics of GMOs to know they are purchasing natural foods (and they can encourage others to do so, too)
- Consider that proper research on GMOs can help consumers form more educated opinions about the practice as opposed to “listening to the hype”
- Consider that elected officials always have the power to make laws regarding GMOs, but it is best if these laws are made based on scientific evidence rather than irrational fears
A large selection of pages has been chosen for you to review (full book = 88 pages).

Student Responses (Extended Response)

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

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).
1) What is the public sentiment towards Genetically Modified Organisms (GMOs)? If most scientists agree that the practice is safe, will there still be critics among the general public?

2) To what degree should public opinion be considered when forming policies and laws about GMOs? What are factors that are important regardless of what the public thinks?

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.

One thing that your students must understand about these Problem-Based Scenarios is that the answer is never just a “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 just a pat on the back—and that’s why proper grading is so important. While students may think 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.
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.

<table>
<thead>
<tr>
<th>Rubric Section</th>
<th><strong>Social Studies Content</strong> – you must show a high level of background knowledge and general understanding of the topic</th>
<th><strong>in other words:</strong> What are you bringing to the table based on previous lessons?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 You provided a high level of background knowledge of the subject.</td>
<td>3 You showed a limited level of background knowledge, and only in certain parts of your response.</td>
</tr>
<tr>
<td></td>
<td>3 You showed a high level of background knowledge, and only in certain parts of your response.</td>
<td>2 You showed barely any background knowledge of the subject throughout your response.</td>
</tr>
<tr>
<td></td>
<td>2 Your response was incoherent, off-topic, or unable to be read.</td>
<td>1 Your response was incoherent, off-topic, or unable to be read.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rubric Section</th>
<th><strong>Production &amp; Distribution of Writing</strong> – you must organize and sustain your writing based on a defined purpose</th>
<th><strong>in other words:</strong> Was it clear what point you were trying to make, and did you focus on that point?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 Your response had a defined purpose, and it was organized with a clear focus on that purpose.</td>
<td>3 Your response had a defined purpose, although it lacked organization and a clear focus on that purpose.</td>
</tr>
<tr>
<td></td>
<td>2 Your response was incoherent, off-topic, or unable to be read.</td>
<td>1 Your response was incoherent, off-topic, or unable to be read.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rubric Section</th>
<th><strong>Integration of Knowledge &amp; Ideas (use of “evidence”)</strong> – you must support your arguments and positions with outside information (i.e. “stimulus items”)</th>
<th><strong>in other words:</strong> Did you back up your position with evidence, quotes, statistics, and facts?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 You provided convincing support/evidence for your main idea and included appropriate sources, facts, &amp; details.</td>
<td>3 You provided adequate support/evidence for your main idea and only limited sources, facts, &amp; details.</td>
</tr>
<tr>
<td></td>
<td>2 You provided only modest support/evidence for your main idea and it was not strengthened by sources, facts, &amp; details.</td>
<td>1 Your response was incoherent, off-topic, or unable to be read.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rubric Section</th>
<th><strong>Language &amp; Conventions</strong> – you must use proper grammar, spelling, vocabulary, and other conventions of the English language</th>
<th><strong>in other words:</strong> Did you limit mistakes and respond in a thorough and professional manner?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 Your response was professional and you demonstrated a command of language conventions.</td>
<td>3 Your response was mostly professional with limited errors related to language conventions.</td>
</tr>
<tr>
<td></td>
<td>2 Your response was rather sloppy with multiple errors related to language conventions.</td>
<td>1 Your response was completely sloppy and showed no effort to follow language conventions.</td>
</tr>
<tr>
<td></td>
<td>1 Your response was incoherent, off-topic, or unable to be read.</td>
<td>NS</td>
</tr>
</tbody>
</table>

Did you limit mistakes and respond in a thorough and professional manner?
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’ written responses, and perhaps oral presentations—will need to meet several expectations from a Language Arts perspective. Students must:

- 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 will 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.
Using the evidence you’ve gathered about Genetically Modified Organisms (GMOs), write an editorial for a school newspaper.

Your editorial should outline your position on the subject and give reasons why you feel the use of GMOs should be encouraged or discouraged.

Share your editorial with your classmates to make sure they are clear about your position and reasoning, and see if they are convinced by your arguments.
How long will it take?

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:

<table>
<thead>
<tr>
<th>Time</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 or 2 periods/ blocks</td>
<td>A specific “subject angle”, focusing only on the stimulus review and classroom discussion</td>
</tr>
<tr>
<td>2 weeks</td>
<td>All steps of a single “subject angle”, with students answering the “Extended Response” questions</td>
</tr>
<tr>
<td>2 weeks or more</td>
<td>The entire PBL Integrated Scenario, with students completing the Product Options, collaborating in groups, and giving presentations</td>
</tr>
</tbody>
</table>

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.

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.
Awarded to

for completion of the following:

Problem-Based Scenario — “Genetically Modified Organisms”

By completing this entire scenario, you have demonstrated that you have the ability to approach a real-world problem and propose a clear and logical response to the challenge.

Given this date in the year

Signed

Great Job!