THINK GLOBALLY, ACT LOCALLY
A Life Science Project | Grades 9-12 | 15-20 hours
**Think Globally, Act Locally: Project Overview**

**Final Product**
Students create an educational visual (brochure, infographic, etc.) suitable to share findings and recommendations to the public.

**Area of Study**
Life Science

**Timeframe**
15-20 hours

**Age Group**
Grades 9-12

**Key Standards Assessed**
- NGSS: LS2.A >> Interdependent Relationships in Ecosystems
- NGSS: LS2.C >> Ecosystem Dynamics, Functioning, and Resilience
- NGSS: LS4.A >> Adaptation
- NGSS: LS4.D >> Biodiversity and Humans
- ESS3.C >> Human Impacts on Earth Systems
- CCSS.ELA-LITERACY.RST.11-12.3 >>
- CCSS.ELA-LITERACY.RST.11-12.7 >>
- CCSS.ELA-LITERACY.WHST.9-12.2 >>
See APPENDIX 1 >> for the full list of standards.

**Rubrics**
- Project Rubric >>
- BIE Presentation Rubric >>

**Planning Tools and Templates**
- Project Design Companion >>
- Student-Facing Planning Sheet >>

**Why Think Globally, Act Locally?**
According to the EPA, 40 percent or more of our nation’s waters are impaired, meaning that the water body does not support one or more of its intended uses, such as swimming, drinking, or consuming fish caught there. Students use the scientific process to determine the health and well-being of a local environment, and connect their role in the larger watershed to which they belong. Students go out into the field and use the tools of ecologists to collect and analyze data, and explore avenues of information sharing.

**Driving Question**
How are we impacting our watershed?

**Project Description**

**Why Think Globally, Act Locally?**

**Challenging Problem or Question**
The driving question for this project is, “How are we impacting our watershed?” You and the students have the opportunity to define the parameters of your unique environmental characteristics. This project can be tailored to all environments and is not restricted to a body of water or particular forest setting, for all environments are included in watersheds. Student engagement is increased when ownership is authentic and the impact is personal.

**Public Product**
The culminating product is an educational visual that includes the final report assessment of the health and well being of a local watershed and its impact on the greater environment. Students will present their findings to a group of relevant stakeholders.

**Key Knowledge, Understanding, and Success Skills**
This task is focused on teaching students how to research, plan, and conduct a relevant scientific procedure to determine the answer to the authentic question of watershed health and its final impact on the larger, global environment. Students research a problem, analyze data, and determine and present a final health assessment to a stakeholder.

**Public Inquiry**
From the entry event forward, students are encouraged to ask questions of experts, research topics that pique their interest, and get input to the process and results. Students have the opportunity to collaborate with others in both small groups and as a whole class; however, the final product will ultimately belong to the individual based on the information gathered through the process.

**Student Voice and Choice**
At the onset of the project, students choose an aspect of watershed health they wish to explore. Working in small, like-minded groups, they will determine how the data will be collected. The students can also determine the final product, both in style and content.

**Reflection**
Reflection is embedded in each stepping stone. It is particularly essential after each of the “moments” when students receive a critique on their findings and recommendations visual, BEFORE they begin the revision process. Students will reflect on the key content and skills, the appropriateness or feasibility of their recommendations, and the quality of their presentation.
EXPLORING WATERSHES

WHAT IS A WATERSHED, AND HOW DO I AFFECT ITS HEALTH? WHY DOES THIS MATTER?

Many different interest groups have used the phrase, “Think globally, act locally.” What does it mean? In particular, what does it mean in terms of the environmental health of the world in which we live? The resources below explore the concept of watersheds, their characteristics, the factors that affect their well-being, and the impact humans have on the global environment that can be affected at the local level.

The Scientific Method in Action

Scientists work in a systematic way, following a set of criteria that allows for others to support or refute their work. Whether you are a physicist, lab technician, or biology student, the steps and guidelines are the same. It all starts with an idea, based in observation, and a set of questions to guide the plan. The resources below explain the steps and provide guidance for how to organize and analyze the information gained from exploration.

EXPLORING EXPERIMENTAL DESIGN

THE SCIENTIFIC METHOD IN ACTION

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The Project Path illustrates the learning process in a project-based, competency-based setting. Project Milestones help clarify the path from Launch to Present, as learners move through an iterative process of building new knowledge and skills, and applying their new knowledge and skills to develop, critique, and refine their products in collaboration with peers.

The Project Path and the Project Milestones provide a concrete but flexible structure for project design and implementation. The Project Milestones are color coded in this Project Path and throughout the document.

**Launch**

1. Student explores the project and develops a set of need to know questions (NTKs).

2. Student teams plan and conduct field research, complete with tools, procedures, data tables, and other relevant considerations.

3. Student teams analyze patterns and trends in their own data as well as the data of the entire class.

4. Student has a rough draft of the education visual including the final report findings.

5. Student teams seek and incorporate feedback to revise and edit presentations.

6. Student teams present findings to an authentic audience.

**Build Knowledge**

**Develop and Critique**
### Project Milestones and Stepping Stones

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<td>Student visits a local watershed to consider the interrelationship between humans and their environment.</td>
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<td>Student explores the driving question: “How are we impacting our watershed?”</td>
<td>In small groups, student explores how to tackle specific aspects of the local impact on watershed health.</td>
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<td>Student teams analyze patterns and trends in their own data as well as the data of the entire class.</td>
<td>Student teams look for patterns and trends in their own data that speak to the health of the watershed.</td>
<td>Student teams share out with the other expert groups and make a determination on overall watershed health based on a body of evidence.</td>
<td>Student teams receive feedback from a panel of experts and peers.</td>
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<td>Student learns about the characteristics and uses of various graphical displays as presentation tools.</td>
<td>Student explores relevant graphics to include in the presentation that will engage and educate the audience.</td>
<td>Students and teacher reflect on their original NTKs and their current sense of understanding.</td>
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**Student teams receive feedback from a panel of experts and peers.**

**Student teams make final preparations for their presentation: rehearsing and revising.**

**Student teams connect to an authentic audience through their performance or product.**

**Student teams present findings to an authentic audience.**

**Student teams have a rough draft of the education visual, including the final report findings.**

**Student teams plan and conduct field research, complete with tools, procedures, data tables, and other relevant considerations.**

**Student teams make final preparations for their presentation: rehearsing and revising.**

**Student teams connect to an authentic audience through their performance or product.**

**Student teams present findings to an authentic audience.**

**Student teams plan and carry out field sample collections.**

**Student teams present findings to an authentic audience.**

**Student teams present findings to an authentic audience.**
Begin with the end in mind! It's time to tee up a few significant decisions you'll need to make about the final project. As you make decisions, reflect on what you believe will work best with your students and your community, as well as time constraints, budgets, and your own skills and comfort levels.

WHAT TO DO:
1. Review the three decision points below.
2. After weighing your options, make your decision and document them in your Project Design Planning Companion >>.

DECISION POINTS:

What will the product and/or performance include?

- **Low Complexity**: Student reports their findings and shares their visuals with classmates and invited guests in the classroom.
- **Moderate Complexity**: Student creates a class blog or website that shares their findings with the public.
- **High Complexity**: Student holds a community event and invites stakeholders to observe their work and discuss their findings.

Who will the audience be, and how will you ensure an audience?

- **Low Complexity**: A group of invited school staff and administrators who visit the classroom.
- **Moderate Complexity**: Professionals from environmental and governmental agencies responsible for the protection of natural resources.
- **High Complexity**: A public forum/display at a town meeting either virtually or in person.

How much decision-making power will students have regarding the topic, audience, and final product?

- **Low Complexity**: Teacher provides the research topic and the type of visual format to create.
- **Moderate Complexity**: Student chooses from a limited list of topics for research and visual display.
- **High Complexity**: Student researches their own topic of interest and creates a visual format of their choosing.
Welcome to Launching Inquiry. The research is clear: learning always begins with making connections. As you think about how you will implement the project, try to find ways to help students make connections early on between their own lives and experiences, and watersheds. The resources offer virtual visits, articles, and helpful forms for organizing questions. The key is to honor all questions as students orient to the project.

A few questions to consider:

• Why is water important to us?
• How does water contribute to our physical and to our mental well-being? Our economy?
• Do you know of communities that don’t have healthy watersheds or reliable sources of clean water?
• What do you know about the impact the lack of healthy watersheds has on those communities?
• What impacts on our community would result if our watershed were unhealthy?

Note: The recommended resources will be helpful as you design lessons for this milestone.

**STEPPING STONES**

**ENTRY EVENT**

Student visits a local watershed to consider the interrelationship between humans and their environment.

**PREVIEW THE PRODUCT**

Student explores the driving question, “How are we impacting our watershed?”

Student develops a list of need to know questions (NTKs) to guide their inquiry.

**EXPLORE THE DRIVING QUESTION**

Student is introduced to the expectations for the final product.

**RECOMMENDED RESOURCES**

**TEXTS AND DATA**

• Scientific American: Why Are Wetlands so Important to Preserve? >>
• EPA: Summary of the Clean Water Act >>
• Chicken Waste and Water Pollution >>

**AUDIO AND VISUALS**

• GLA Virtual Watershed Tour >>
• Protecting Our Community’s Watersheds and Streams >>

**TOOLS AND FORMS**

• Know/Want-to-Know Chart >>
• Inquiry Chart >>
As you design your launch, consider this three-part structure to help guide your efforts: Entry Event, Project Preview, and Driving Question Exploration. The launch may be only one lesson, but these three key segments each involve careful decision-making, planning, and materials development. Let’s take a closer look.

**ENTRY EVENT**
Captivating experiences create buzz, provide context, access prior knowledge, and tap student interests, curiosities, and values.

**PREVIEW THE PROJECT**
Student is introduced to the expectations for the final product.

**EXPLORE THE CHALLENGE QUESTION**
Student accesses and assesses prior knowledge, and asks their own questions. Student uses their questions to frame inquiry into issues central to the project.

**MATCH, LIT.**
Student participates in an engaging shared experience that generates excitement about the Think Globally, Act Locally project.

**PROJECT, LINKED.**
The connection between the provocation or entry event and the final project is totally clear; basic project expectations are communicated upfront.

**INQUIRY, LAUNCHED.**
Opportunities for students to generate their own need to know questions (NTKs) tap into their innate curiosity as they begin to connect with the challenge question, “How are we impacting our watershed?”

**WATCHING VIDEOS ABOUT THE IMPORTANCE OF WATERSHEDS**

**A GUEST SPEAKER ABOUT WATERSHEDS**

**A GUIDED TOUR OF A WATERSHED AREA**

**MIGHT LOOK LIKE...**

**DESIRED OUTCOMES**

**STUDENT REVIEWS AND ANNOTATES THE PROJECT SHEET AS YOU GUIDE THEM THROUGH IT, SETTING DATES FOR THE MILESTONES OF THE PROJECT.**

**STUDENT Completes a KWL/KWHLAQ or NTK chart to capture their prior knowledge, questions, and project need to know.**

**QUESTIONS ABOUT WATERSHEDS**

**QUESTIONS ABOUT DATA COLLECTION AND ANALYSIS**

**EXAMPLES OF INITIAL STUDENT NEED TO KNOWS**

**QUESTIONS TO KNOW ABOUT NTKS:**
Use this time to collect student questions rather than answer their questions. These questions become the driving force of learning in the project as students seek to find answers throughout the project, with your support.

The list is a living document that you should refer back to on a regular basis. Ask your students: What’s been answered? What did we think was important that we now know isn’t?**
THE ENTRY EVENT
Take a walk in the local environment. If you have woods, streams, or rivers nearby, great! But even if your local jungle is concrete, you're still connected to the watershed. Jot down your thoughts and your wonderings about the environment. Now, think about the term “watershed.” What does it mean to you? What do you already know? What would you like to know? Again, jot down your thoughts and wonderings.

LESSON LAUNCH
To focus students’ thinking during the entry event:
• When it rains, where does the water go?
• When you open your tap, where does the water come from? How did it get there?
• What role does the local environment have in ensuring that we have access to clean water?
• Thinking and seeing like a scientist, what do you notice? What do you wonder?

GUEST SPEAKER OPTIONS
Find a guide who can explain how the local environment connects to the watershed. This could be a professor at a local university, an environmental engineer, a representative of the local extension or cooperative services, or a watershed coordinator. The EPA’s Surf Your Watershed tool can help you identify resources specific to your location.

PREVIEW PROJECT EXPECTATIONS
We’re going to collect data and analyze it to draw a conclusion about the health of our watershed. Then, using an educational visual such as a brochure, infographic, or other appropriate representation, we’re going to present that information to the people who need to know what we found. Our goal is to inform the public of the state of our environment and offer our input on how to maintain and/or improve the overall health of the local watershed.

As you work, think about what pictures and data would be important to share with your audience, and be sure to collect this information along the way.

Take a few minutes to explore the Student Planning Sheet.

EXPLORE THE DRIVING QUESTION
Our driving question for our learning ahead is, “How are we impacting our watershed?”

INITIATE THE NEED TO KNOW PROCESS
Before we head out, write down three questions that you hope to have answered about those three ideas: our local environment, our role in it, and the health of the watershed. As we explore, jot down new and useful information you hear, and listen for answers to your questions. Also jot down any new wonderings you might have.

SYNTHESIZE AND REFLECT
• During the generation of NTKs, students may need support to guide and organize their thinking. Consider the following activities:
  • Use the Question Formulation Technique for formulating questions from videos or presentations.
  • Begin with an I Wonder Poem.
  • Have them create a Concept Map or Spider Map to process their noticings.
  • These can be living documents students update throughout the project. As students generate their questions, encourage them to deepen them. Costa’s Questioning and Three Types of Questions are useful for this process.

CLOSING THE LAUNCH
As you think about the project you will undertake, consider the skills and knowledge you would need to be able to determine the health of the watershed and communicate your findings. Review your need to know. Which seem most important or most pressing to you? Why? How could you learn what you need to know? How could you find answers to your questions? Think about what you saw and the area in which you live. What do you predict you will discover about the health of the watershed in your area? Why? How is being in nature or outside different when you are seeing and thinking like a scientist?
Welcome to Planning and Conducting the Experiment. This milestone encourages students to work in groups of similar interests as they follow through the steps of the scientific method.

Learners will design and conduct an experiment to measure the health of the watershed. Throughout, they will be guided by their need to knows, questions, and experiment design.

The goal of this milestone is to help students develop and practice skills that are essential to conducting the experiment they design, including data collection and analysis. To support learners, you will design and facilitate different mini-lessons for various student groupings based on observed student needs.

The recommended resources on the left will help students create, organize, and share their data collection plans.

Note: The recommended resources will be helpful as you design lessons for this milestone.

MILESTONE #2: PLANNING AND CONDUCTING THE EXPERIMENT

BUILD KNOWLEDGE

1. Welcome to Planning and Conducting the Experiment. This milestone encourages students to work in groups of similar interests as they follow through the steps of the scientific method.

2. Students should know by now that the leading causes of pollution in our waterways are sediments, bacteria, and excess nutrients. Erosion, runoff of animal waste, and the overflowing of combined sewers are just a few ways these pollutants reach our waters. In small groups, students will now explore how to tackle specific aspects of watershed health.

3. Keep in mind that the ultimate goal is to create an educational visual to educate the audience. It's worthwhile to stop in each milestone and collect pictures that could become part of the end result.

RECOMMENDED RESOURCES

TEXTS AND DATA
- The National Forest Service >>
- Utah Education Network >>
- Watersheds >>
- Riparian Review - Stream Side Science >>

AUDIO AND VISUALS
- Indicators of a Healthy Watershed >>

TOOLS AND FORMS
- Research the Issue >>
- Test With an Experiment >>
- Google Drive >>
- Dropbox >>

Student teams analyze patterns and trends in their own data as well as the data of the entire class.

FIELD DATA COLLECTION

Student teams plan and carry out field sample collections.

Keep in mind that the ultimate goal is to create an educational visual to educate the audience. It's worthwhile to stop in each milestone and collect pictures that could become part of the end result.

Note: The recommended resources will be helpful as you design lessons for this milestone.

PLANNING THE EXPERIMENT

Student teams plan and conduct field research, complete with tools, procedures, data tables, and other relevant considerations.
1. PLANNING THE EXPERIMENT

Through a Think-Aloud >> model your process for designing a plan for collecting data. Be sure to comment on each of the parts of the plan for which students will be responsible. Share your metacognition so students understand how you choose or designed your data sheet, how you choose the tools to be used, and how to break down the process so specific roles can be assigned.

You can follow up the modeling by facilitating a brainstorming session to identify tools, data recording options, and data collection roles.

DESIGN TIPS
Consider some grouping techniques for the reluctant learners and the students who tend to work as individuals.

For the purposes of this project, a group size of 3-4 is ideal, with each student playing a specific and important role.

The overall point of the project is interconnectivity, and this is an example of this concept at the process level.

2. FIELD DATA COLLECTION

Managing all the elements of designing the data collection plan, break down the lesson into smaller lessons focused on each element: the overall plan, the selection of tools, the data sheets, and the creation and assigning of roles.

Use field guides, especially those specifically for the local ecosystem. If they are not available, students can use online resources to research and print their own "homemade" guides or make their own by first taking pictures and then classifying later.

Check out these BIE resource on Working With Outside Experts >> and Creating and Using Team Contracts >> which provide useful tips to help students learn from field experts either in person, via online meeting, or by using videos on how to use the equipment and which parameters students can study based on available resources. In some instances where you are the expert, you may need to prepare demos for equipment use.

Check out this BIE resource on Revisiting Need to Know >> with tips on how to incorporate the questions students created in the launch.

FORMATIVE ASSESSMENT IDEAS
Organizing the plan and procedure is key to this milestone. Assessments should encourage students to clarify roles and expectations.

Ideas for Activities
• Choose a Topic for Scientific Inquiry >>
• Test With an Experiment >>
• Matching specific tools to a specific use or data to be collected, use Attribute Sorts >>
• Topic Essay >>

Reflection and Synthesis Prompts
Why is it important for one person to do the same job through-out the experience? How will you make sure that your activity itself does not affect the health of the watershed? What kinds of impact are unavoidable?

Formative Assessment Ideas
• Create and annotate a concept map organizing their plan around the central theme of their research.
• Summarize the experimental design and student’s own specific role in the procedure.
• Check out these Exit Ticket >> ideas from BIE.

Suggestions for Feedback and Support
• Determining and assigning roles, have them create a storyboard of the data collection process using Draw-Label-Cap-tion >>.
• Use these teacher-student conferencing >> tools.

Standards
NGSS.HS-LS2-7 >>; CCSS.ELA-LIT.RST.11-12.7 >>; CCSS.ELA-LIT.RST.11-12.1 >>; CCSS.ELA.LITSL.11-12.1 >>; CCSS.ELA.LITSL.11-12.1.A >>; CCSS.ELA.LITSL.11-12.1.A.D >>.

Students will be able to...
Explore in small groups how to tackle specific aspects of watered-eshed health.

• Students will be able to...
• Choose a Topic for Scientific Inquiry >>
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CCSS.ELA.LITSL.11-12.3 >>; CCSS.ELA-LIT.RST.11-12.3 >>; CCSS.ELA-LITSL.11-12.1.A >>; CCSS.ELA.LITSL.11-12.1.A.D >>.

2. FIELD DATA COLLECTION

Plan and carry out field sample collections.

• Take Notes and Organize Information >>
• A version of My Favorite No >> to review and solidify safe, acceptable field work techniques

Conceptual Prompts
• Write a series of One-Sentence Summaries >> that outline what one would expect to find in a healthy watershed.
• Use Paragraph Frames >> to compare and contrast healthy vs. unhealthy watersheds.

• Why is it important for one person to do the same job through-out the experience? How will you make sure that your activity itself does not affect the health of the watershed? What kinds of impact are unavoidable?

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• Check out these Exit Ticket >> ideas from BIE.
Welcome to Data Analysis. This milestone is designed to get the students thinking about how to best represent their own data as well as the data of the whole class.

The collaboration and discussion that happen in this milestone follow the same principals that scientists actively use with their findings in the field. Lessons here should support graphical displays, statistical analysis, and the idea that decisions are made around larger pools of evidence versus small, individual groups. It is important to consider how many facets of evidence you would like each student to consider before making a final determination and how much freedom of choice you want to support in a largely group-work oriented endeavor.

The resources provided give assistance in the organization, display, and analysis of data.

Note: The recommended resources will be helpful as you design lessons for this milestone.

**STEPPING STONES**

**SMALL-GROUP DATA ANALYSIS**

Student teams look for patterns and trends from their own data that speak to the health of the watershed.

**LARGE-GROUP DATA AND RESULTS**

Student teams share out with the other expert groups and make a determination on overall watershed health based on a body of evidence.

Reminder: charts, graphs, and photos can be marked for inclusion in the final product.

**RECOMMENDED RESOURCES**

**TEXTS AND DATA**
- Online Graphing Tutorial >>
- Reading and Interpreting Data >>
- Statistics Intro: Mean, Median, and Mode >>

**AUDIO AND VISUALS**
- Present Data >>
- Getting Started With Google Graphs >>
- Work With Numerical Data in Excel >>

**TOOLS AND FORMS**
- Present Data >>
- Getting Started With Google Graphs >>
- Work With Numerical Data in Excel >>

**BUILD KNOWLEDGE**

**2**

Student teams plan and conduct field research, complete with tools, procedures, data tables, and other relevant considerations.

**3**

Student teams analyze patterns and trends in their own data as well as the data of the entire class.

**4**

Student teams ideate and develop a proposed solution to their selected problem.

**MILESTONE #3: DATA ANALYSIS**

**SMALL-GROUP DATA ANALYSIS**

Student teams look for patterns and trends from their own data that speak to the health of the watershed.

**LARGE-GROUP DATA AND RESULTS**

Student teams share out with the other expert groups and make a determination on overall watershed health based on a body of evidence.

Reminder: charts, graphs, and photos can be marked for inclusion in the final product.

**RECOMMENDED RESOURCES**

**TEXTS AND DATA**
- Online Graphing Tutorial >>
- Reading and Interpreting Data >>
- Statistics Intro: Mean, Median, and Mode >>

**AUDIO AND VISUALS**
- Present Data >>
- Getting Started With Google Graphs >>
- Work With Numerical Data in Excel >>

**TOOLS AND FORMS**
- Present Data >>
- Getting Started With Google Graphs >>
- Work With Numerical Data in Excel >>
1. SMALL-GROUP DATA ANALYSIS

Share a sample data set with students. Using a Think Aloud, model for them how you decide what tools to use to analyze the data. Depending on the data and what you see in it, your Think Aloud could include detecting patterns, making predictions, asking additional questions, or drawing inferences. As you model, be sure to make specific reference to the strategies you used, and connect those strategies to what you noticed and what you hoped to learn from the analysis of the data.

1. SMALL-GROUP DATA ANALYSIS

<table>
<thead>
<tr>
<th>Standards</th>
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<tr>
<td>NGSS.HS-LS2-1 &gt;&gt;; NGSS.HS-LS2-2 &gt;&gt;; NGSS.HS-LS2-6 &gt;&gt;; NGSS.HL-LS2-1; CSEL21HST11-127 &gt;&gt;; CSEL21HST11-127A &gt;&gt;</td>
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Students will be able to:

- Explore in small groups how to tackle specific aspects of watershed health.
- Make inferences from the data, use a Say/Mean Chart >>.
- Verbalizing what they see in the data, use these Math Sentence Stems for Writing >>.
- Drawing Conclusions Thinking Guide >>
- Problem Solving Via Imagery >>

Reflection and Synthesis Prompts

- What strategies did you use to make meaning of this data? What does my data tell you?
- How do you know that the meaning you found in your data is accurate?
- What trends or patterns do you find worth sharing with the whole class?
- Based on only what you have personally done in this experiment, what is your opinion on the health of the local watershed?
- How do you think the sharing of data happens between the agencies who study the environment? What types of challenges do you see with performing this task at a larger scale?

Formative Assessment Ideas

- Tweet 3 headlines that would inform the world on your initial findings.
- Write a paragraph using a protocol like DRA to Analyze Data Charts >>.
- Check out these Exit Ticket >> ideas from BIE.

Suggestions for Feedback and Support

- Getting started examining their data, the See-Think-Wonder >> protocol can help.
- Making inferences from the data, use a Say/Mean Chart >>.

2. LARGE-GROUP DATA AND RESULTS

Share out with the other expert groups and make a determination on overall watershed health based on a body of evidence.

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- How do you know that the meaning you found in your data is accurate?
- What trends or patterns do you find worth sharing with the whole class?
- Address limitations to their measurements, data sets, and sources of error in a letter of advice to anyone who might consider doing this experiment in the future.
- Discuss and critique exemplar data tables of unrelated data with a partner at all levels of the rubric.

Formative Assessment Ideas

- Resources for supporting students’ development of Mathematical Habits of Mind >>
- Graph Tutorial >>

PREPARATION CONSIDERATIONS

The more details handled ahead of time, the smoother the process. Review statistical analysis, and/or provide resources on simple statistics. Provide graph paper, rulers, computers, posters, etc., for presentation of data. Outline expectations for the presentation to class (remind students to include what the data is saying, not their opinions). And finally, plan your Think Aloud—this template >> may be useful.

REFLECTION AND SYNTHESIS

Students should reflect on what they will be sharing with the larger group as preliminary findings. In the next stepping stone, they will synthesize the data of the entire group to make a final assessment of watershed health.
Welcome to the Create the Visual. This milestone focuses on how students will present their findings to their chosen audience through a graphical display. Depending on the choice of presentation, this visual may need to stand on its own, so its design is critical.

Throughout the experiment, students have been documenting and photographing their work and analyzing their data graphically. Now is the time to pull it all together and send a message to the community about the health and well-being of the local watershed. As you design lessons in this milestone, encourage the skill of determining importance, as space on a visual is limited.

Remind the students to keep the audience in mind when making their choices, as they’re the ones whom the students are trying to engage and inform.

Note: The recommended resources will be helpful as you design lessons for this milestone.

**EXPLORE THE GENRE OF INFOGRAPHICS**

Student teams learn about the characteristics and uses of various graphical displays as presentation tools.

**ORGANIZE GRAPHICS**

Student teams consider audience and purpose while designing the product.

**DRAFT THE PRODUCT**

Student teams draft the presentation of their design solution.

**RECOMMENDED RESOURCES**

- **TEXTS AND DATA**
  - 10 Creative Presentation Tools to Try >>

- **AUDIO AND VISUALS**
  - The Ad Council Exemplars >>
  - YouTube Infographics >>

- **TOOLS AND FORMS**
  - Canva Poster Templates >>
  - Google Drawing >>
  - Brochures in Google Docs >>
  - Infographics >>
1. EXPLORE GRAPHICAL PRESENTATIONS

Before sending the students to explore on their own, it might be helpful to model how to analyze an existing visual. Present an exemplar visual, through a Think-Aloud, to share what you notice. Discuss the key elements of the exemplar. Then, share your thinking about how the exemplar meets a specific purpose of the author or creator and how it meets the needs of its intended audience.

As a teacher, your comfort level with newer-style visuals may be limited. In the beginning, you may want to limit student format presentations may be limited. As a teacher, your comfort level with newer-style visuals may be limited. In the beginning, you may want to limit student format presentations may be limited.

1. EXPLORE GRAPHICAL PRESENTATIONS

2. ORGANIZE GRAPHICS

3. DRAFT THE PRODUCT

IDEAS FOR ACTIVITIES
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Welcome to the Revise the Product. This milestone focuses on incorporating the feedback from peers and experts to improve upon the design and message of the finished product. Mini-lessons in editing vs. revising as well as modeling how to give and receive feedback will strengthen the final presentation. Feedback can come in many forms: from peer to peer, peer to student, and a variety of experts. If bringing in outside sources, it would be helpful to create feedback sheets or templates to streamline the process. Something that is written would help students return to the suggestions through the revision process.

The resources provided offer support for students as they critique and receive feedback.

Note: Check out the recommended resources for prototyping suggestions.

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**MILESTONE #5: REVISE THE PRODUCT**

**DEVELOP AND CRITIQUE**

**DEVELOP AND CRITIQUE**

1. **Student teams share their solutions with an audience.**
2. **Student teams seek and incorporate feedback to revise and edit presentations.**
3. **Student teams analyze patterns and trends in their own data as well as the data of the entire class.**
4. **Student has a rough draft of the education visual including the final report findings.**
5. **Student teams plan and conduct field research, complete with tools, procedures, data tables, and other relevant considerations.**

**STEPPE STONES**

**SELECT CONSTRUCTIVE FEEDBACK**

Student teams receive feedback from a panel of experts and peers.

**REVIEW AND EDIT**

Student teams revise their presentation based on the feedback received.

**RECOMMENDED RESOURCES**

**TEXTS AND DATA**
- Strategies to Enhance Peer Feedback >>
- Peer Review >>
- Experts in the Classroom >>
- 4 Strategies for Teaching Students How to Revise >>

**AUDIO AND VISUALS**
- Peer Assessment: Reflections From Students and Teachers >>

**TOOLS AND FORMS**
- What is Effective Feedback? >>
- Student Feedback Tools and Resources >>
- Editing Checklist >>
1. SOLICIT CONSTRUCTIVE FEEDBACK

Feedback can feel very personal and may require practice on a smaller scale. Allowing students to have input into the rubric can add an extra level of engagement and ownership but does take more time.

Peer feedback is powerful and should be used in addition to the input of experts, whether they are in the field of education, graphic design, or the agencies that protect the waterways. The more feedback the better, so every opportunity you can provide to the students is valuable.

2. REVISE AND EDIT

Now that their work has been reviewed and critiqued, it’s time to make changes for the final product. Student comfort level will vary with the revision process, even within groups, so circulating, conferencing, and supporting are your main goals to ensure student confidence and success. You may need to conduct supportive mini-lessons on a variety of topics, including tracking changes within a document, running spell check, and adding persuasive details to pieces of writing. Enlisting the help of Language Arts teachers, especially those the students know, offers a deeper level of support in the writing process.

REFLECTION AND SYNTHESIS

Keep in mind that the students don’t need to act on all input, especially if the student feels strongly about including an aspect in their presentation. Asking them to reflect on how they feel about the input is a valuable metacognitive piece and an opportunity to hear what the student is thinking.

IMPROVING THE DESIGN

These two BIE resources, Using Rubrics and Critique Protocols, have ideas for how students can use rubrics and protocols to reflect and refine their work.
Welcome to Present. This is the milestone where all the pieces come together for the final presentation. Now the students become the educators as they present their findings to their audience on the health of their local watershed. Throughout the process, the students have become closely connected with their own environment, and their work has real implications for the community. Feeling prepared is an important component to giving an effective presentation, so allowing for sufficient practice is key to the success of this milestone.

And what to do with all those visuals? Perhaps they can be on display in a public community setting to educate audiences well after the official presentations are over.

Note: The recommended resources will be helpful as you design lessons for this milestone.

Student teams present findings to an authentic audience.

STEPPING STONES

PRACTICE & PREPARE

Student teams make final preparations for their presentation: rehearsing and revising.

PRESENT

Student teams connect to an authentic audience through their performance or product.

REFLECT

Students and teacher reflect on the project together.

RECOMMENDED RESOURCES

TEXTS AND DATA

• 10 Tips for Speaking Like a TED Talk Pro >>
• 15 Ways to Calm Your Nerves Before a Big Presentation >>

AUDIO AND VISUALS

• DIY Brochure Holder >>

MULTIMEDIA

• How to Design a Stunning Brochure >>
• How to Make Business Brochures That Stand Out >>

Student has a rough draft of the education visual including the final report findings.
1. PREPARE

Before you can present, you need to Locate an Audience. Do this well in advance in order to make all necessary arrangements. If traveling to a venue, your preparation will have additional aspects to consider. You may decide to take video of the presentations and send them to the appropriate audience. In this case, rehearsals are an important part of the prep work.

| Standards | CCSS.ELA-LITERACY.SL.11-12.1.B-D >>; CCSS.ELA-LITERACY.SL.11-12.4 >> |

2. PRESENT

How much of this presentation will be oral, and to what degree will the visual stand on its own? Will the public have access to the work after the main presentation? How will groups divide the presentation? These are all considerations you’ll need to determine ahead of time to ensure that everyone is on the same page for the smoothest possible event.

<table>
<thead>
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<th>Decision Points</th>
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<tbody>
<tr>
<td>• What role will reluctant presenters play, and how will they prepare?</td>
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<td>• Who will run the technological pieces, if appropriate?</td>
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<tr>
<td>• How will the visuals be displayed for public access?</td>
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<tr>
<th>Ideas for Activities</th>
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<td>• Practice being interviewed (in pairs) about the process of the experiment and what was discovered about the local environment (can be filmed like a newscast and rewatched for review).</td>
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<tr>
<td>• Make color copies for audience members ahead of time.</td>
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3. REFLECT

The reflection process is both essential and more complex than you may first imagine. Reflecting on the project as a whole should take students on a journey of thinking about their new learning of content and skills and the quality of their final products. Check out this BIE resource for additional ideas on eliciting feedback from the audience.

| Standards | CCSS.ELA-LITERACY.SL.11-12.4 >> |

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<td>• How will you account for absences, illnesses, and last-minute technical difficulties?</td>
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<td>• Will you allow for Q&amp;A from the audience at the end of the event?</td>
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<td>• How will your guests be invited and escorted to the event?</td>
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APPENDIX I: STANDARDS

BUILD KNOWLEDGE (MILESTONES 2-5)

NEXT GENERATION SCIENCE STANDARDS HS-LS2.A >>

Interdependent Relationships in Ecosystems
HS-LS2-1 >>
Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

HS-LS2-2 >>
Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

Ecosystem Dynamics, Functioning, and Resilience
HS-LS2-C >>
Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

HS-LS2-7 >>
Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

HS-LS2-D >>
Social Interactions and Group Behavior
HS-LS2-8 >>
Evaluate the evidence for the role of group behavior on individual and species’ chances to survive and reproduce.

DEVELOP & CRITIQUE (MILESTONES 2-5)

CCSS.ELA-LITERACY.RST.11-12.3 >>
Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

CCSS.ELA-LITERACY.RST.11-12.7 >>
Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CCSS.ELA-LITERACY.WHST.11-12.2 >>
Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

CCSS.ELA-LITERACY.SL.11-12.1 >>
Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) on grades 11-12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

CCSS.ELA-LITERACY.SL.11-12.1.A >>
Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

DEVELOP & CRITIQUE CONT’D (MILESTONES 2-5)

CCSS.ELA-LITERACY.RST.11-12.1.B >>
Work with peers to promote civil, democratic discussions and decision making, set clear goals and deadlines, and establish individual roles as needed.

CCSS.ELA-LITERACY.RST.11-12.1.C >>
Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

CCSS.ELA-LITERACY.RST.11-12.1.D >>
Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

PRESENT (MILESTONE 6)

CCSS.ELA-LITERACY.SL.11-12.4 >>
Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
got more?

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www.bie.org >>

and

www.redesignu.org >>

acknowledgements

Helen Keller said it best, “Alone we can do so little; together we can do so much.”

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Special thanks to the following reDesign colleagues for developing this project frame:

Karen McCallion
Antonia Rudenstine