NATIONAL GEOGRAPHIC

GEO-INQUIRY PROCESS: EDUCATOR GUIDE

ASK

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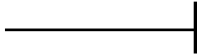
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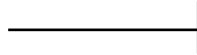ACT

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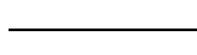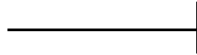
GEO-INQUIRY PROCESS

ASK — COLLECT — VISUALIZE — CREATE — ACT
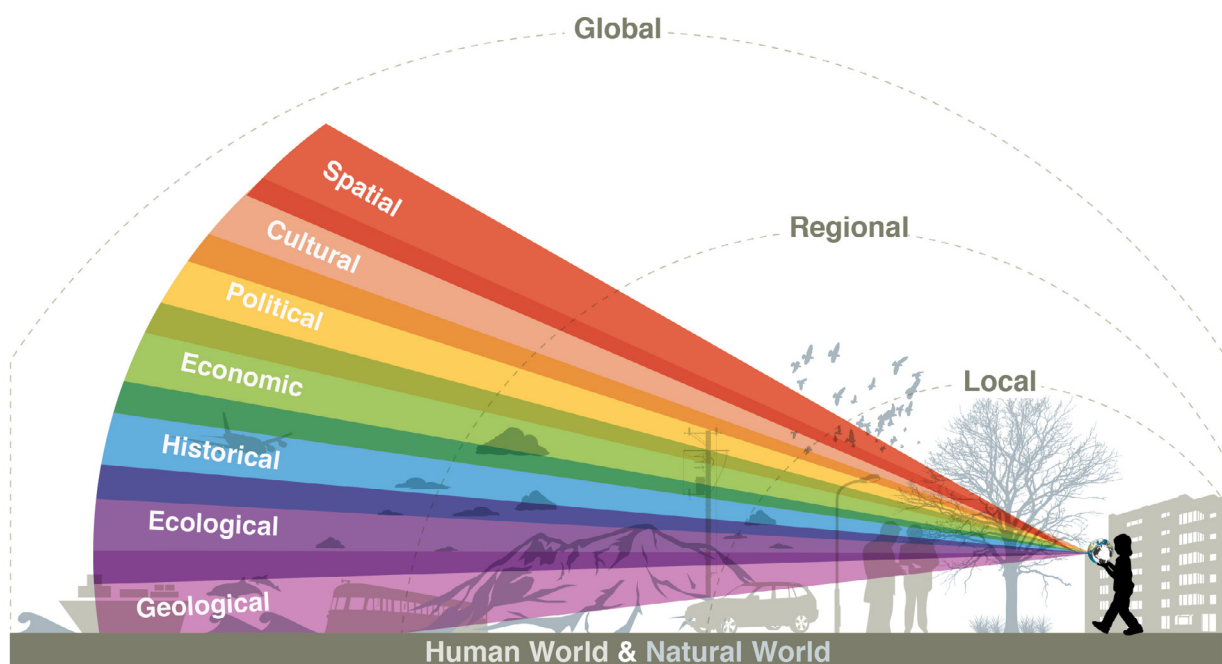
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INTRODUCTION
TO GEO-INQUIRY

More than ever, our world is interconnected and today's students need to understand how the complex and dynamic human and natural systems interact in order to make smart decisions and function effectively. The study of geography is essential to the comprehension of how our world works.

Geography, the study of places and the relationships between people and their environments, seeks to understand where things are, why they are there, and how they develop and change over time. Geography offers students two avenues to understand the world, human and physical geography. Human geography studies cultural, political, technological and social systems, and physical geography studies Earths physical and natural systems.

Geographers, those who study geography, observe the world in spatial terms, and are interested in three basic questions: *Where is it? Why is it there? Why care?* They seek to describe the world using the knowledge, skills, and tools of the discipline, such as maps, globes, graphs, photography, video, and remote sensing images. These instruments are suited for different purposes and illustrate a range of information including showing patterns, interactions and change over time.

The Geo-Inquiry Process endeavors to help students develop the skills, knowledge, and tools of a geographer. It provides a systematic way to investigate and understand the world through the patterns, processes, and interactions between human and natural systems and then to act on their conclusions.

The Geo-Inquiry Process is a five-step method designed to teach the skills necessary to think and reason geographically, and includes asking Geo-Inquiry Questions, acquiring geographic information, organizing and analyzing information, and using the information to answer Geo-Inquiry Questions for informed action. The Geo-Inquiry Process relies on geographic perspective as a foundation, offering students a unique lens to analyze space, place, and the interconnections of systems in our world. Geographic perspective is interdisciplinary and allows for the examination of complex issues at various scales. Think of scale as being the "zoom lens" of geography. The scale can be local, regional, or global. By using a geographic perspective with the Geo-Inquiry Process, students begin to connect complex components, see patterns, and make connections as they look at the world differently in order to make informed predictions, well-reasoned decisions, and take action.

ORGANIZING
THE CLASSROOM INTO TEAMS

The Geo-Inquiry Process is designed to build on student questions that reflect their interests and issues in their local community. This process is project-based, authentic, and experiential in nature. It requires students spend time asking, investigating, organizing, analyzing, and creating. This process is best done in groups rather than individually. We suggest two ways to organize the learning: (1) by collaborating as a whole class to answer one Geo-Inquiry Question, or (2) by having small groups generate their own unique Geo-Inquiry Questions. Below are tips for arranging each of these scenarios.

WHOLE CLASS LED

While a whole class led project might be easier to manage, care should be taken to select a topic interesting to most students.

GENERATING QUESTIONS

It is important the entire class participates in framing the Geo-Inquiry Question. Some ways to select a question are:

- As a class, have students brainstorm local issues or problems they would like to explore.
- Select a specific issue or problem for them to research.

In either case, have students brainstorm queries related to the topics and then vote for the question they would like to investigate.

CREATING A PROJECT PLAN

Once students have selected the Geo-Inquiry Question, they will need to determine the following:

- What data will they need to collect?
- How will they collect the data?
- How long will it take to collect the data?
- What type of research will they need to do?
- Who should they talk to about the issue?

You can assign specific tasks to small groups of students with clear due dates. Identify and assign tasks to small groups at each phase of the Geo-Inquiry Project using a timeline. Depending on the project and time frame, all groups could work in parallel on the same task (e.g., conducting a survey) or have different tasks (e.g., some students may gather maps while others interview local leaders). Whenever possible, allow students to select tasks based on their interests. Alternatively, you can assign tasks to students based on their strengths and challenges.

SETTING GOALS

Set class learning goals for the project. *What process skills do you want students to practice and/or master? What subject-specific content do you want them to understand at the end of the project?* In addition, have students create their own goals for individual participation and learning. For example, students who tend to be followers during group projects may set a goal to take leadership over one aspect of the project. Students who tend to take over a project might set the opposite goal: to listen to their classmates more. Students may also set specific academic goals, such as improving their spelling on project work or mastering new vocabulary.

SMALL GROUP LED

Having students work in small groups to pose their Geo-Inquiry Questions gives them more control to select a meaningful topic, but having multiple groups might also present organizational challenges.

ESTABLISHING A TOPIC

Students can be given complete autonomy within their groups to identify a topic of interest, or you may ask groups to come up with specific questions within a wider topic. For example, you might identify a local issue related to a topic you are studying in class, but then have each small group generate and investigate its own related Geo-Inquiry Question. In either case, carefully vet students' initial idea to be sure they can meaningfully explore it with available resources.

SETTING MILESTONES

Establish a timeline with frequent milestones that all groups must meet so teams will not fall behind. Some checkpoints might require teacher review and approval, such as the initial topic or an action plan that has students working outside of the classroom. Others can be quick check-ins for the teacher to confirm the milestone was met, rather than evaluating it.

ORGANIZING
THE CLASSROOM INTO TEAMS

COLLABORATION ACROSS DISCIPLINES

The Geo-Inquiry Process is a cross-disciplinary process, so consider enlisting the assistance of other teachers or school staff, such as librarians, to support this project. Students could choose to address a variety of issues and collect social science or scientific data, develop graphs, and capture photographs or video. They will write text and use technology tools. Science, art, math, technology, and other teachers could assist in planning and implementing the project.

GEO-INQUIRY PROCESS RESOURCE PACKET CONNECTIONS

- Ongoing Reflection worksheet

The timeline should include regular ongoing and throughout-the-project reflection. Use the Ongoing Reflection worksheet after each phase of the project has been completed or after students complete a milestone. Ongoing reflection allows students to check their progress against their plan, identify challenges and opportunities for growth, celebrate accomplishments, and assess their learning. Remind students that they can develop their basic abilities through dedication and hard work.

GROUP ROLES AND PROJECT PLAN

Have groups identify roles and responsibilities for each team member. Review teams' positions and task lists to ensure all students are actively and evenly participating. Student roles might include leader, teacher liaison, communications manager, and editor. Individuals may take on more than one job or change positions throughout the process. Specific member tasks might include developing surveys, presenting background research, contacting relevant community groups or organizations, recording data, or creating a Geo-Inquiry Storyboard.

PEER AND MENTOR SUPPORT

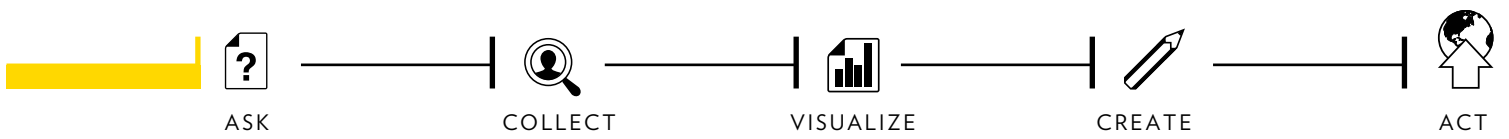Peers can be excellent motivators. Create support groups consisting of one person from each team and have them meet periodically so members can share progress, receive feedback, or collaborate to solve problems. Adults with expertise or interest can also serve as support for small groups during the project.

PHASE 1: ASK

DEVELOPING A GEO-INQUIRY QUESTION

ASK   COLLECT   VISUALIZE   CREATE   ACT

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GEO-INQUIRY TUBRIC

Framing Words	Person or Entity	Action or challenge	Audience or Purpose	**Geo-Inquiry** Where is it? Why there? Why care?

Have your students use the Geo-Inquiry Tubric to help them develop their Geo-Inquiry Questions.
Tubric courtesy of the Buck Institute for Education.

Asking good Geo-Inquiry Questions is at the heart of the Geo-Inquiry Process. These activities can be used to help students develop their skills in asking geographic questions and to give them a chance to explore a variety of local issues or problems. These materials are designed to help students narrow in on a specific topic or issue, and frame and refine their geographic questions into a Geo-Inquiry Question that will drive their project and be the focus of the subsequent phases of the project.

INTRODUCING THE CONCEPT

1. Explain to students they will be doing a project to explore a local issue or problem through a geographic lens and will start by posing a Geo-Inquiry Question. Explain that the Geo-Inquiry Question will address three main questions:
   • Where is it?
   • Why is it there?
   • Why care?
2. For example, have students think about their school. What geographic questions might they ask about the school? Model some simple examples, such as: *Where is the school located? Why is it located there? What is located near the school?*

Use the first question (where) to help students identify ways to describe a location. For example, their school's location can be described by the street name and building number; the city, county, and state; the country; hemisphere; and the latitude and longitude.

3. Ask students for additional questions and then model some more complex Geo-Inquiry Questions, such as: *Why is the school located here? Why are specific places located near the school? What does this location have in common with the location of other schools in your town? What is different about the locations of the schools?* Ask students to think about where a new school might be built in the district. Model how to develop some Geo-Inquiry Questions to help them determine the best place for a new school including why people care where a school is located. Guide students to think about different kinds of information such as major roads, student population, geographic space for the school, and regional building costs. Work toward developing more complex questions that explore how and why things change from one location to another and the results of those changes.

4. Give students additional practice differentiating Geo-Inquiry Questions from the nongeographic queries using the list included in the Geo-Inquiry Questions worksheet. On the list, numbers 1, 3, 6, 7, 9, 11, 13, 14, 15, 16, 18, and 19 are Geo-Inquiry Questions.

5. Share example questions with the class that allude to the importance of places: *Why are good harbor facilities an important part of New York City's location? How does the climate of Florida's cities affect the movement of vacationing winter visitors? How does the climate and terrain of Vail, Colorado, contribute to its popularity as a ski resort?* Place students into small groups and ask them to write questions about your town that would help to explain the importance of some of its features or its location.

6. Ask students questions that encourage them to explore the interconnectivity of human or physical features: *Where do most people live in the world? Why are so many large cities located along rivers?* Working in small groups, have students write questions investigating how people or physical features are organized in your town.

7. If students need extra practice asking Geo-Inquiry Questions, have them brainstorm queries based on their town. Place students into small groups. Give students prompts related to your town. For example, you might specify an area of your town, an important economic activity or industry, or a physical feature of your town. For each prompt, give students two minutes to think of as many related Geo-Inquiry Questions as they can. After you have given them two or three prompts, have them reexamine their question list and strike-through any they feel are not actually Geo-Inquiry Questions. Then have them circle a few questions that interest them and add them to the Possible Geo-Inquiry Questions worksheet. You may also want to use the Geo-Inquiry Tubric for students to practice creating Geo-Inquiry Questions.

GEO-INQUIRY PROCESS RESOURCE PACKET CONNECTIONS
- Geo-Inquiry Questions worksheet
- Possible Geo-Inquiry Questions worksheet
- Geo-Inquiry Tubric

DEVELOPING SKILLS AND EXPLORING TOPICS
NEWS SURVEY

1. Have the class survey the local newspaper(s) in print or online and/or watch or listen to the local news over a period of one or two weeks. Ask them to take notes on any news stories that interest them. Encourage them to record what happened in the story and any people or organizations mentioned.

2. Once students have accumulated a list of interesting news stories, put them into small groups and have them share what they selected. Have each team pick a few topics and complete the Practicing Geo-Inquiry Questions worksheet for one or two subjects. Note: Students will use the Practicing Geo-Inquiry Questions worksheet several times as they explore topics. You may wish to provide several copies or have students answer the questions on a separate sheet of paper.

3. Ask students to add the most interesting questions to the Possible Geo-Inquiry Questions worksheet.

PHASE 1: ASK
DEVELOPING A GEO-INQUIRY QUESTION

ASK — COLLECT — VISUALIZE — CREATE — ACT

ISSUES

1. Instruct students to focus on issues or disputes in your local area and research them by searching news articles online or in print, requesting information from local groups, listening to an expert or speaker visiting your class, or identifying familiar topics.

2. Have students work in small groups to complete the Practicing Geo-Inquiry Questions worksheet for one or two topics of interest. Students should circle any questions they are interested in exploring and add them to the Possible Geo-Inquiry Questions worksheet.

BRAINSTORMING

1. As a class, begin brainstorming general topics that interest students (e.g., sports, birds, or social issues). Give them two or three minutes to note their ideas. Remind students that brainstorming means listing everything you can think of quickly, without comment or judgment.

2. During the brainstorming session ask students to use a web concept map to deconstruct the high-level topics that interest them to a local level. For example, when investigating ecosystem management, they might drill down to a particular location and ecosystem, and then focus on a particular topic, such as the reintroduction of wolves. Encourage them to be specific and focus on local topics.

3. After students have brainstormed, display all the lists and concept maps from each of the small groups. Give students different colored markers and have them put their initials beside any ideas that interest them. Have students select a partner with similar interests and have them choose two topics and complete the Practicing Geo-Inquiry Questions worksheets for each subject. They should choose the best questions from each and add them to the Possible Geo-Inquiry Questions worksheet. The class lists can also serve as a starting point for organizing students into small groups by interests or for narrowing down topics for whole class projects.

ASKING THE COMMUNITY

1. Divide students into small groups and have them create a list of five questions they can ask community members to determine what those individuals think are important community issues. They should list these questions in the Asking the Community worksheet. Have groups peer review each other's lists and provide feedback. Students can poll community members informally. If you prefer for students to create a formal survey or interview, you can find additional information in Phase 2 and the Conducting Interviews worksheet and Developing a Survey handout.

2. Encourage students to speak with a range of community members to get their ideas of important local issues. Brainstorm types of local experts, such as government officials or community organizers, who might have special insight into the community. If possible, reach out to these community members to determine what problems or issues they think are important.

3. Have students summarize what they learned through speaking with community members in the Asking the Community worksheet.

4. Instruct students to identify two or three topics or issues that interest them from speaking with the community and complete the Practicing Geo-Inquiry Questions worksheet. Have them add the interesting questions to their list in the Possible Geo-Inquiry Questions worksheet.

PHASE 1: ASK

DEVELOPING A GEO-INQUIRY QUESTION

ASK — COLLECT — VISUALIZE — CREATE — ACT

ADDITIONAL WAYS TO GENERATE TOPICS

• Create an interest board. This can be a physical bulletin board in the classroom or an online platform. Students can add newspaper clippings, web links, images, or brief write-ups.
• If possible, invite community speakers into the classroom to discuss areas of interest.
• Have students take photographs in their community and use these as prompts to identify issues or topics.
• Discuss issues important to students, such as specific social and environmental issues, and look for reflections locally.
• Take students on a field trip to the local newspaper office, city building, or nature center. Have students learn more about what the staff does and the local issues they address. If you have already selected a general topic for the class, take the students to a relevant place in the community to further explore that topic.
• Share the National Geographic Geo-Inquiry Case Studies included in the Geo-Inquiry Process Resource Packet with students. Their work started with a Geo-Inquiry Question. Have students read about these explorers and their projects and have them identify the Geo-Inquiry Questions on which the projects are based.

TAKING ACTION

1. As students are crafting their Geo-Inquiry Questions, they should consider how answering this question could have the potential to make a positive change in their community. Remind them that they will create a Geo-Inquiry Story based on their question and they will use that story to take action on a specific issue.

2. Have students read and discuss the Taking Action worksheet. Explore how some issues require a public policy change and some can be addressed through community action. Give students the example of a city park with a lot of litter. Ask them to think of a way to address this concern through policy. For example, they address their concern by attending a city council meeting and requesting that the city provide more trashcans and a few recycling bins to help remove litter. Alternatively, they could address the issue through community action. For example, they could organize weekly park cleanup days.

3. Instruct students to keep these different ways to address community problems in mind as they write their Geo-Inquiry Question.

PHASE 1: ASK
DEVELOPING A GEO-INQUIRY QUESTION

ASK — COLLECT — VISUALIZE — CREATE — ACT

REFINING GEO-INQUIRY QUESTIONS

1. Once students are familiar with writing Geo-Inquiry Questions and have explored possible community topics, have them focus on one issue or problem they want to investigate. If you have preselected a topic or issue for this project, introduce that topic to students. If students will be developing their own question(s) in small groups or as a class, have teams review the Possible Geo-Inquiry Questions worksheet and select a query or two related questions that interest them as a starting point for developing their Geo-Inquiry Question which will drive their project.

2. The questions students select may reflect an interest in the issue but will need refinement to become the Geo-Inquiry Question or driving question of the project. Students should briefly research their topic to gather more information. The goal is for students to have enough information about their topic to lead to a meaningful Geo-Inquiry Question. Have students use the Refining Your Geo-Inquiry Question worksheet to hone their questions. Their final Geo-Inquiry Question should be specific, actionable, thoughtful, something that cannot be answered by simply looking at a map or searching the Internet for the topic, and something that genuinely interests students. This will be the driving question for the rest of the project. As students fine-tune their Geo-Inquiry Question, circulate around the room and prompt students to develop questions that dig deeper into the topic. If the whole class will be working on the same question, have small groups propose one or two questions and then have the class vote on the question they most want to pursue. You can also work as a class to refine the question.

GEO-INQUIRY PROCESS RESOURCE PACKET CONNECTIONS

- Possible Geo-Inquiry Questions worksheet
- Refining Your Geo-Inquiry Question worksheet
- Geo-Inquiry Questions Flow Chart worksheet

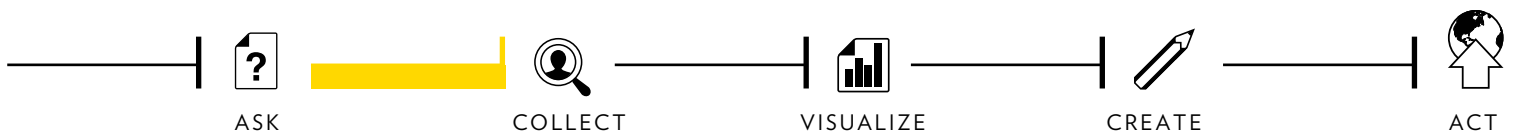### TIPS FOR HELPING STUDENTS DEVELOP GOOD GEO-INQUIRY QUESTIONS

- When brainstorming, encourage students to write their initial questions without editing them. Encourage them to write for at least three minutes and coax them to write the entire time. Brainstorming in this way can force students beyond the first basic questions that come to mind.
- Have students write additional queries after researching their topic or issue. Sometimes students lack the knowledge about a topic to craft the questions that can drive a project.
- Tell students to choose questions that they cannot answer just by looking at a map or searching the Internet for the topic. Ask: *If I gave you ten minutes, could you find the answer to this question?* If the answer is yes, students should move on to another question or rewrite the existing question to dig deeper.
- Give students general but more complex questions that they might apply to their specific topic or issue. For example: *Why is this there? Does this form a spatial pattern? How does this being here affect the people or natural environment nearby?*
- Students can test if they have a Geo-Inquiry Question by using the Geo-Inquiry Flow Chart.

PHASE 2: COLLECT
ACQUIRING GEOGRAPHIC INFORMATION

ASK · COLLECT · VISUALIZE · CREATE · ACT

PHASE 2: COLLECT

ACQUIRING GEOGRAPHIC INFORMATION

ASK — COLLECT — VISUALIZE — CREATE — ACT

A student explores a stream using a homemade water scope. Photograph courtesy of Lori Epstein/National Geographic.

GEO-INQUIRY PROCESS RESOURCE PACKET CONNECTIONS

- Geo-Inquiry Process handout
- Vocabulary handout

Once students have framed their Geo-Inquiry Question, they will need to conduct background research and then acquire the data that will enable them to answer their questions. The possibilities for types of information students will need to gather and ways in which they can gather this information are diverse. The activities in this section are designed to help students build solid background information about their topic through questioning, research, and data collection; to make sense of what types of data may be helpful to them; to identify data collection methods; and to design data collection tools. Since students' data needs will depend on the issue they are investigating and the questions they asked, you should select the activities that best apply to students' project(s).

UNDERSTANDING GEOGRAPHIC INFORMATION

Introduce students to the vocabulary terms listed in the Vocabulary handout. Not all of these terms will apply to every project, so this list is just to familiarize students with terms they may encounter in their data collection.

PHASE 2: COLLECT
ACQUIRING GEOGRAPHIC INFORMATION

ASK — COLLECT — VISUALIZE — CREATE — ACT

GEO-INQUIRY PROCESS RESOURCE PACKET CONNECTIONS

- Background Information worksheet
- Sources of Information in Your Community handout
- Contacting Community Experts worksheet
- Evaluating Resources worksheet
- Taking Notes worksheet

GATHERING BACKGROUND INFORMATION

1. Ask groups to create a list of general questions (Need-to-Knows) or topics they will need to know more about in order to answer their Geo-Inquiry Question and write them in the Background Information worksheet. The goal is for students to become experts on their topic, so their Need-to-Knows should focus on an overall understanding of the issue or topic. For example, if students asked a question about how factory runoff is affecting a local stream, they may want to research ways to measure stream health.

2. Have students identify people or organizations in their local community with knowledge and expertise on their topic or issue. Refer them to the Sources of Information in Your Community handout. Ask students to list names, titles or positions, contact information, and area of expertise in the Background Information worksheet. At this point, students can email or write these individuals or organizations to request information not already available on an organization's website. The Contacting Community Experts worksheet will guide them through several ways to contact community members.

3. Students should conduct library and Internet research to identify resources that may be useful to them for this project. Students should evaluate these materials for quality and accuracy. A key to examining sources is available in the Evaluating Resources worksheet.

4. Students should create an annotated bibliography in the Background Information worksheet to organize their research and easily return to documents later in the project to answer their Need-to-Knows.

5. Students can use the Taking Notes worksheet to track their research throughout the project.

6. Students should look for ways in which this issue or topic, or a similar one, has already been addressed and analyze previous solutions. Ask students to add this information to the Background Information worksheet.

7. Once students have gathered information on their topic or issue, they should write a summary in the Background Information worksheet. This summary should include a brief analysis of any previous solutions to the issue, if applicable.

8. Students should also craft a one- to two-sentence statement explaining why this topic or issue is important to their community.

9. After researching their topic or issue, students may want to adjust their Geo-Inquiry Question. This should be students' last opportunity to do this, and any changes should be minor and not send them in a different direction from their original question.

IDENTIFYING NECESSARY DATA
BRAINSTORMING DATA TYPES

1. Brainstorm what types of data might be helpful to answer the Geo-Inquiry Question. Geospatial data can include statistics, surveys, observations, scientific measurements, interviews, images, and videos tied to a geographic location.

PHASE 2: COLLECT
ACQUIRING GEOGRAPHIC INFORMATION

2. Encourage students to think more about geospatial data, which may be less familiar to them. Some examples include various types of maps; basic location information; census information, such as population and statistics; topographic information; satellite imagery; and place-based scientific data, such as temperature and water quality; and survey and interview data. Introduce some of these examples and then give students additional time for brainstorming.

3. Prompt students to think about both primary and secondary sources. Have students look back over the brainstormed list and identify examples of each. Then give them time for additional brainstorming.

UNPACKING GEO-INQUIRY QUESTIONS

1. Regardless of whether students developed their own Geo-Inquiry Question or it was given to them, deconstructing the question can help students to look at it in a different way and help them to better see what kinds of data they will need in order to answer it. Model this for students using the example question: *Where should a new middle school be located in the school district?*

2. First, have students identify and define the terms used in their question. In our simple example, students should define *school* and *location.*

3. Next, ask students to write a hypothesis. For example: *We will learn which locations have the necessary characteristics for a new school.*

4. Use the statement of what they will learn to write simpler questions or Need-to-Knows that underlie the more complex question they are asking. One might ask: *What makes a good location for a school? Where are other schools located? Are there any rules about where schools can be located? Are there any schools that are too crowded? How much space does a school need? How much does it cost? Who decides to build a new school?*

5. Instruct students to look at the simpler questions and identify the data they will need to determine an answer. In our example, students need to know the locations of other local schools and a map including each campus. They may consider interviewing experts,

such as principals, or school board members to get characteristics of good school locations or look at local ordinances and legal requirements that govern the sites of educational facilities. Students may want population data to determine areas with more children, and examine aerial photographs to identify areas that might have enough room for a large structure.

6. Another example, if needed, is based on the Geo-Inquiry Question, Why are the trees on Maple Street losing their leaves in April? Some smaller questions they might ask are what kind of trees are on Maple Street? Are they all the same species? What do these particular trees need to live? Is there a bug that could be eating these trees and making them lose their leaves? Have they gotten enough water? What is located near these trees?

7. Once you have finished modeling the process, have your class work in small groups and follow the process to deconstruct their Geo-Inquiry Questions. This method is also outlined in the Deciding What Data You Need worksheet. As teams brainstorm data types best suited to answer each Need-to-Know, they can refer to the class list developed earlier.

8. Instruct students to create a final, very specific list of data and record each type on the table in the Planning Your Data Collection worksheet. For example, they should write, "pH and dissolved oxygen levels in the French Broad River upstream and downstream of the paper mill," not "water quality data."

9. Once students create their data list, they should complete the chart in the Planning Your Data Collection worksheet. That plan may be as simple as looking at a map or as complex as arranging an expedition to a river to collect data and should include a project timeline.

PHASE 2: COLLECT
ACQUIRING GEOGRAPHIC INFORMATION

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GEO-INQUIRY PROCESS RESOURCE PACKET CONNECTIONS

- Deciding What Data You Need worksheet
- Planning Your Data Collection worksheet
- Taking Photographs and Video handout
- Photograph and Video Release handout
- Photography: The Basics handout
- Videography: The Basics handout

COLLECTING DATA

COLLECTING SURVEY OR INTERVIEW DATA

1. For surveys and interviews, students will need to create the questionnaire or prepare questions for their specific question.
2. Instruct students to exchange their survey or interview questions with another team. Groups should review, test (if applicable), and provide feedback on each other's work.
3. Using peer feedback, students should revise their questionnaire or interview questions as needed, and complete a final review of their document to ensure that (1) their design will provide the data necessary to answer their Geo-Inquiry Question and (2) the data they collect can be measured and analyzed effectively. Students should be thinking ahead to make data organization and analysis easier at that phase of the project.

COLLECTING PHOTOGRAPHIC AND VIDEO DATA

1. In Phase 4, students will develop a Geo-Inquiry story about their project and should think about the images or video they will need for that prior to data collection. Make sure they understand returning to get photographs or video may not be possible. Stress that it is better to have more images or footage than they need than to not have enough.
2. Be sure students are competent in the basic mechanics of the equipment they will use to capture photographs or videos. Students should have a backup plan such as their phones.
3. Examine some photographs with students and discuss each one. *Ask: Which images do you like best? What elements draw your attention? Why?* You can address composition: *Where are the objects, people, or animals in the shot (foreground or background, in the center, or to the sides)? Is there a sense of movement in the image and how is that captured? What draws your eye first in the image and how does your eye move across the picture? From which perspective is the photograph being taken? How is the image cropped? What story is the image trying to tell?* Students can write down some of the key elements that make the photographs successful for reference when taking and editing their own photographs. If possible, work with an art teacher or local photographer or videographer to discuss the basics of producing a good photograph or video.
4. Direct students to the Taking Photographs and Videos handout, Photograph and Video Release form, Photography: The Basics handout, or Videography: The Basics handout for tips.

COLLECTING SCIENTIFIC DATA

1. Students may collect scientific information through field tests or observation.
2. Be sure that students have thought out their data collection method and have a written plan for data collection before they go into the field.
3. Check students' data collection plans to make sure they are scientifically valid and that they will likely yield the correct information for the project.
4. Have students think about the best way to organize the data they plan to collect and prepare a data sheet if appropriate.

PHASE 2: COLLECT
ACQUIRING GEOGRAPHIC INFORMATION

ASK   COLLECT   VISUALIZE   CREATE   ACT

COLLECTING DATA IN THE FIELD

- Getting students into the community to collect data is a key component of this process. Going into the field essentially means getting out of the classroom to collect data. Gathering data can be low tech with paper and pencil or high tech with smartphone applications, spreadsheets, or specialized collection kits. Generally, field activities include surveying, interviewing, mapping (paper or digital), collecting scientific data, taking photographs, and capturing video.

- Field-based data collection tips are provided for students in the Collecting Data in the Field handout.

- Location data is a type of geospatial data that students should always collect when they are in the field. Most smartphone mapping applications allow you to drop a pin and record the latitude and longitude of your current location. You can also download applications designed to capture geolocation data. If available, a GPS unit also captures this data. Students should always check location data with another reputable source as bad signals can sometimes cause errors and impact data quality.

- Be sure to have the proper permissions from your administration, from parents, and from locations and organizations when collecting data in the field.

- Scout locations where students will be collecting data to avoid any surprises on the day(s) of data collection. This step will help you to determine what additional adult support you need.

- If students intend to capture photographs or video, encourage them to plan for several individuals to do so in case of equipment malfunction and to take shots from multiple perspectives. If students will be publishing or publicly presenting their work, ensure they have the proper permissions from any individuals in their photographs or video.

- Ensure students have the proper safety equipment for their data collection. For example, individuals collecting data in or near a body of water may need life jackets, protective clothing, rubber boots, or gloves.

- Students collecting data in an urban location should select a safe area with the appropriate amount of adult supervision. Prior to fieldwork, discuss how to approach people to answer survey or interview questions safely and professionally.

- For students who will be collecting field data independently, send information home with tips and safety precautions and ask parents to sign an acknowledgment that students will be working independently and that parents or guardians are responsible for providing appropriate supervision.

- Students should carefully consider methods for recording and organizing their data. Each team should discuss and prepare a plan for collecting and organizing their data prior to beginning this project. Students should create any recording tools (e.g., a spreadsheet, table, or image folder) before collecting their data and have a plan to save their data in multiple locations. Ask them to consider the following questions: *Is it appropriate and safe to use a laptop or tablet to record data? Could a cellular phone be used for data collection? Would it be best to record the data on paper and enter it into a computer in the classroom?*

PHASE 2: COLLECT

ACQUIRING GEOGRAPHIC INFORMATION

ASK — COLLECT — VISUALIZE — CREATE — ACT

DATA COLLECTION: SURVEYS

1. The Developing a Survey handout provides information about types of surveys and survey questions and will guide students through creating surveys. Students should create their survey and have it peer-reviewed prior to collecting data.
2. Encourage students to limit their survey questions so participants can take the survey quickly and are more likely to complete the entire questionnaire.

DATA COLLECTION: INTERVIEWS

1. The Conducting Interviews handout provides tips for conducting interviews and a space for individuals to list their interview questions. All queries should be written, peer-reviewed, and revised before conducting the interview.
2. Interviewing is a skill, and students should practice with a peer, receive feedback, and make changes to either the question or their delivery. Provide examples of scenarios that students may experience while interviewing, such as interviewees who give short answers. Record students' interviews and let them assess their technique.
3. Remind students that although they have prepared questions in advance, they can ask additional questions if answers need to be clarified.
4. Students should obtain permission from participants in advance or at the beginning of the interview. Be sure to monitor students' contact with interviewees to ensure the project has been properly explained and that both parties understand the logistics.
5. The interview should be recorded (either video or audio) and students should notify the participant in advance or at the beginning of the discussion and ask them to sign a photo and/or video release if appropriate. Students should also take notes during the interview.
6. If possible, have students conduct interviews with their small group. Each student should assume a role. One student can ask the questions, one can record (video or audio) the interview, and one or more can take notes and ask follow-up questions as necessary.
7. Although in-person interviews are best, they are not always possible. For interviews conducted remotely, students can use an online video conferencing service that can record the conversation. Most computers are equipped with a standard program that can record conversations over the Internet. If these options are not available, students can conduct the call over speakerphone and record it using an audio recording device. Again, students should obtain permission from the interviewee prior to recording.

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GEO-INQUIRY PROCESS RESOURCE PACKET CONNECTIONS

- Contacting Community Experts worksheet

TIPS FOR CONTACTING COMMUNITY MEMBERS

- Have groups designate one person as the liaison to each community group or individual they plan to contact to avoid confusion and the appearance of "pestering." The worksheet, Contacting Community Experts, provides tips for calling, emailing, and mailing community experts.
- Students should be as sure as possible that they are contacting the right person or group. They may be able to find appropriate contact information online or make a preliminary call to inquire who the appropriate person is to discuss the topic.
- When calling a community member or group, students should plan what they need to ask in advance and write a list of talking points so they are clear and concise even if they get nervous. They need to schedule the call with the expert in advance and let the person know generally what they will discuss. Students should record the conversation (with the person's permission) or take good notes so that should a second call be necessary, they do not repeat questions.
- Often, email is the best way to reach a community member or organization. Email gives the organization or individual time to gather the requested information and respond. Emails should be formatted as a business email, with a clear subject line. A template for writing a business email is included in the Contacting Community Experts worksheet. Students should have their email reviewed and edited before it is sent. If students do not get a reply in a week, they can send a follow-up email or make a preliminary call. If they don't get a response after the second contact, they should move on to another source.
- In some cases, students may need to send a typed letter to request information. The letter should be reviewed, carefully edited, and include a self-addressed, stamped envelope for the person or organization to send a response.
- Regardless of the method students use to contact a community member or organization, they should make sure what they are asking for is (1) something the person or organization is likely to have or know where to get (2) not an overwhelming request, and (3) written clearly and concisely.

PHASE 2: COLLECT
ACQUIRING GEOGRAPHIC INFORMATION

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DATA COLLECTION: RESEARCH

1. Students will need to find data online through a library or public records. In some cases, a group may need to visit a library or other institution to look through microfiche, archived, or other nondigital material. You can consult the tips in the Collecting Data in the Field handout as appropriate.

2. Students using online data should evaluate the source of their information using the form included in the Evaluating Resources worksheet. Additionally, the form in the Taking Notes worksheet may help students without a preferred note-taking method.

3. Many city and county websites have basic, local demographic data, and the contact information for staff that could direct students to further information on a particular topic. They can start by looking through the site's menu to see what is available, identify relevant departments, or download or request publicly available datasets.

4. The open data movement is a popular mission to place city data online for greater transparency. Information that can be found through open data includes demographics, maps and boundaries, property information, public safety information (often including crime maps), transit information, and more. To access this material, students should search for the name of their city or town, state, and "open data."

5. Gathering geospatial information may be new to students. Students can reference the Collecting Geospatial Data handout.
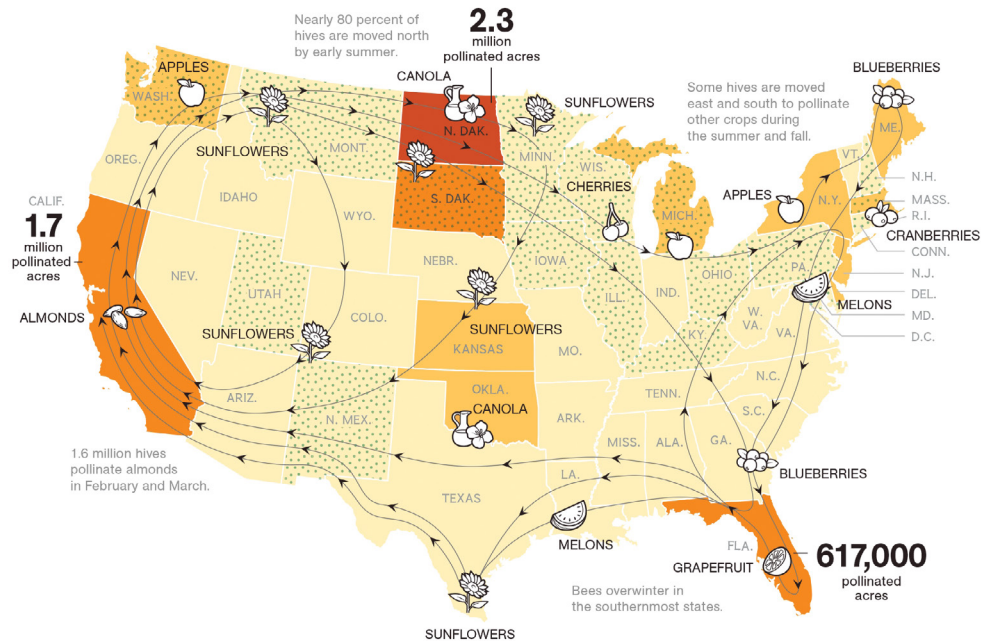
PHASE 3: VISUALIZE
ORGANIZING AND ANALYZING GEOGRAPHIC INFORMATION

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PHASE 3: VISUALIZE

ORGANIZING AND ANALYZING GEOGRAPHIC INFORMATION

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Data visualization is key to telling a story. Check out this National Geographic map of bee movement across the continental United States. Map courtesy of Virginia W. Mason, Jason Treat, and Matthew Twombly/NG Staff; Meg Roosevelt. Sources: Nicholas Calderone, Cornell University; National Agricultural Statistics Service; Economic Research Service, USDA.

Collecting data is only one step in answering Geo-Inquiry Questions. This section guides students through organizing the data they have collected, visualizing that data in a way that conveys an understanding of the issue they are researching, and putting that data onto a map or displaying it with visuals. The Geo-Inquiry Process focuses on using the geographic lens as a way to better share data and tell a story.

CREATING ROUGH DRAFT MAPS

Having students create a working map(s) up front emphasizes the geographic nature of the Geo-Inquiry Process and serves as a way to organize data as it is collected.

1. Introduce different types of maps to your students using the Basic Types of Maps handout.
2. Have students begin by creating a basemap of their study area. Several basemap types are described in the Creating a Rough Draft Map worksheet. Students can find maps online by searching for the name of their school, town, or their study site. They should select the type of map, such as a street map or satellite view, that best suits their purposes. Have them print out three to five copies of their maps. If you cannot print the maps, you can often order similar maps or find them for purchase in your town.
3. Alternatively, students can create basemaps using online mapping software and save them for later editing. There are a number of mapping tools available online that enable students to add points and data to a basemap. Most computerized mapping programs allow students to select a basemap (e.g., political map, satellite map) and navigate to their study area by typing in a location. Data layers, such as population or land use, can be downloaded from different online sources and added to these maps.

**GEO-INQUIRY
PROCESS
RESOURCE PACKET
CONNECTIONS**
• Creating a Rough
  Draft Map worksheet
• Basic Types of
  Maps handout

4. As students collect data, they can add it to a copy of their basemap. For example, if students collected numerical data, such as dissolved oxygen, from several places, they can plot the collection sites on their map and add the numerical data. Students conducting surveys at different locations can mark those locations; they can add highlights, quotes from the survey, or a chart or graph synthesizing the data. If students are using printed maps, they should only add one kind of data (i.e., survey or dissolved oxygen) per map. They can write directly onto the map or number the locations and jot information on numbered sticky notes, so they can move them around more easily.

5. Students using an online mapping tool have several options for adding data to their basemap. The simplest way for students to add their collected data to their maps is by placing a marker on each point. They can also draw shapes, which can be useful for highlighting areas of the map. Students can choose from several styles of point markers or lines and change their colors. Varying colors can allow the user to emphasize important features of the data or distinguish variables. When using online mapping tools, students can place all relevant data on one map, as they will be able to turn the items they add on or off so they can look at one type of data at a time.

6. Students can also add photographs and other images to their basemaps. If students are using printed maps, they should paste several images per page into a word processing document so that they can print out multiple images per page. They can then cut them out and add them to the map. For best results, they should glue the map onto a larger paper, such as poster board. Then the students can glue the images around the map and draw lines to link them to the appropriate location on the map.

7. If students are using an online mapping site, they can typically add an image or link to any marker they create. Note that students will usually need to click on the markers to see the images.

8. Students can also add any initial impressions they have about the areas they have been studying. These might include landmarks, resources, or interesting divisions they noted. As with other data, students can write directly onto a map or use sticky notes. If they are using an online mapping site, they can add a marker with this information.

PHASE 3: VISUALIZE
ORGANIZING AND ANALYZING GEOGRAPHIC INFORMATION

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GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Students may create a thematic map to visualize their data. Today, most maps are created with geographic information systems (GIS), a system for capturing, storing, checking, and displaying data related to positions on the Earth's surface. GIS helps trained personnel study the distribution and patterns in nature and human development.

Instruct students to review the different map types and decide which best represents the data to the audience. Examples of common map types are listed below.

Choropleth Map
This map uses color in shades in geographic areas to provide visual values showing variation or patterns. Example: **Youngest and Oldest Counties (http://www.nationalgeographic.org/maps/youngest-and-oldest-counties/)**

Graduated Symbol Map
This map uses symbols that change in size according to the value of the data reflected in an area represented. Example: **Freshwater Use in the West (https://www.nationalgeographic.org/photo/freshwater-use-west/)**

Dot Distribution Map
This type of map uses a dot is scaled in proportion to intensity to show the quantity, value and presence of data in an area. Example: **Veterans Statistics—Veterans Day 2015 (https://www.census.gov/library/visualizations/2015/comm/veterans-statistics.html)**

ORGANIZING GEOGRAPHIC DATA

How students organize collected information is dependent on the data type. The goal of data organization is to place students' materials into a format that allows them to easily see patterns or trends.

1. Many types of data can be organized onto a spreadsheet, most of which can export data into compatible charts or graphs. Students may have already created tables or spreadsheets as a data collection tool. If they did not, they should create them at this point.

2. When creating spreadsheets, students should think about the information they want to display and how many elements it contains. The first row of the spreadsheet should include column headings for each variable represented on the document. For example, if students collected water temperature, dissolved oxygen, and pH from three locations along a river or stream, then they need a column for temperature, one for dissolved oxygen, and one for pH.

GEO-INQUIRY PROCESS RESOURCE PACKET CONNECTIONS

• Choosing the Graph You Will Use handout

3. Have students select a graph to visualize their data, if appropriate. Students can view examples of graphs in the Choosing the Graph You Will Use handout.

4. Once students have their data in the appropriate chart, graph, or map form, they can examine their data for trends and patterns.

5. Students should ensure all relevant data is linked to locations on their draft maps. By the end of this step, students should have visual representations (charts, graphs, other) of their data and maps.

SELECTING VISUALS

Data visualization is the process of communicating or understanding data using a visual context. The goal of data visualization is to communicate large numbers and complex concepts clearly, precisely, and efficiently. It is important to select visuals that best explain the data and further the story you are telling.

Types of Visualization	Examples
Comparison—comparing one or many sets of data	Column, Bar, Circular Area, Line, Scatter Plot, Bullet, Table
Composition—how individual parts make up the whole of something	Pie, Stacked Bar or Column, Area, Waterfall
Distribution—understand outliers, the normal tendency, and the range of information in your values	Scatter Plot, Line, Column, Bar
Trend—how data set(s) performed during a specific time period	Line, Dual-Axis Line, Column
Relationship—how one variable relates to one or more variables. Used to show how something affects another variable in a positive, negative, or neutral way.	Scatter Plot, Bubble, Line
Complex—how to show multiple components and interrelationships of data	Infographics, GIS, Photograph, Video, Maps

PHASE 3: VISUALIZE
ORGANIZING AND ANALYZING GEOGRAPHIC INFORMATION

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GEO-INQUIRY PROCESS RESOURCE PACKET CONNECTIONS

• Analyzing Your Data worksheet

ANALYZING GEOGRAPHIC DATA

Using their visual representation, tell students to examine their data for patterns and trends and try to comprehend what is displayed. Data analysis is dependent on material collected. Ask students to recognize trends and to ask questions to better understand how or if those patterns relate spatially, and how they answer the Geo-Inquiry Question.

1. Have students inspect the trends on their graphs or charts and note ways variables may relate to places on the map. Ask: *Do you think some measured variable depends on its proximity to other features on your map? What evidence supports this? What evidence disagrees with this?* Look at other measured variables. *Do you see any matching trends among those variables?*

2. Ask students to consider using color schemes or symbols to display patterns clearly. Other techniques they could consider are shading graded between the highest and lowest values or circling high values in one color and low ones in another color. Keep in mind that some colors have meaning. Red, for example, is often used to mark areas of danger or very high or low values, and blue often represents water.

3. Ask students questions to help them see the patterns or trends in their data. What you ask will depend on the subject that groups are investigating and on the type of data collected. Here are some examples of questions you might ask:
   a. *What features are located around areas where there are high values?*
   b. *What trends do you notice happening on the landscape?*
   c. *Where are their more businesses? more homes?*
   d. *Is there a linear trend in the data?*
   e. *Is there a radial trend in the information?*
   f. *Is the data distributed evenly, in clumps, or randomly?*
   g. *Does the data pattern seem to follow any other trends? (e.g., wind direction, access to better transportation, proximity to business facilities, stores, topography, food, entertainment)*

4. Instruct students to complete the worksheet Analyzing Your Data worksheet, which provides a set of questions to help with the data analysis.

5. When students finish analyzing their maps, they should be able to answer their Geo-Inquiry Question. If they cannot, they should revisit their data, adjust maps and graphs, or conduct more research to help them see the information in a different way. They should begin to think about the Geo-Inquiry Story that their data tells. If students could not answer their Geo-Inquiry Question, they can still look at the data they gathered to see if there is a story to tell.

PHASE 3: VISUALIZE
ORGANIZING AND ANALYZING GEOGRAPHIC INFORMATION

GEO-INQUIRY PROCESS RESOURCE PACKET CONNECTIONS

- Creating a Geo-Inquiry Map with Your Solution handout
- Creating the Final Version of Your Map worksheet

CREATING FINAL MAP VERSIONS

Once students have answered their Geo-Inquiry Question, they should create a map or maps to illustrate the data and tell their Geo-Inquiry Story.
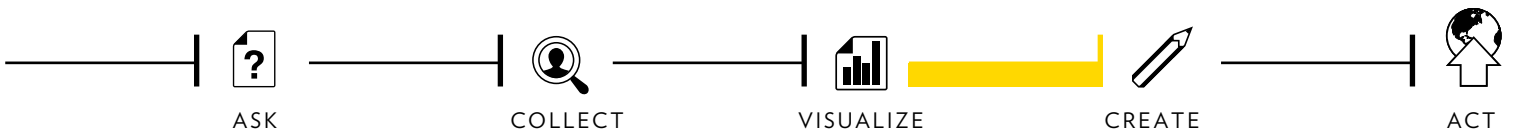
1. Have students examine their maps for the clearest patterns that answer their Geo-Inquiry Question and support their story. They need to study critically the information they gathered. Not everything collected, mapped, or graphed is necessary to tell their story. Groups should archive their culled materials. Use the Creating a Geo-Inquiry Map with Your Solution handout to walk students through this process.

2. Students working with printed maps should edit and finalize one or more of their working maps or create clean documents showing just the key data. Groups using online mapping programs can create different versions of their map by selecting which markers and other data are visible. They can print and/or save the resulting versions. Students should use the checklist in the Creating a Final Version of Your Map worksheet.

3. Remember that students will be creating Geo-Inquiry Stories that can include text, narration, images, and other types of visuals in the next phase. At this point, students may want to represent some of these elements spatially on a map.

4. Students can finalize any graphs or charts they plan to use in their story. They can make adjustments to the graphs they created during data analysis or create new versions. They should include a title and description and make sure all the labels are clear and easily readable.

5. The graphs and maps they want to use may change as they begin to plan their story, so they may revisit these steps in Phase 4.

CREATING FINAL MAP VERSIONS

Once students have answered their Geo-Inquiry Question, they should create a map or maps to illustrate the data and tell their Geo-Inquiry Story.
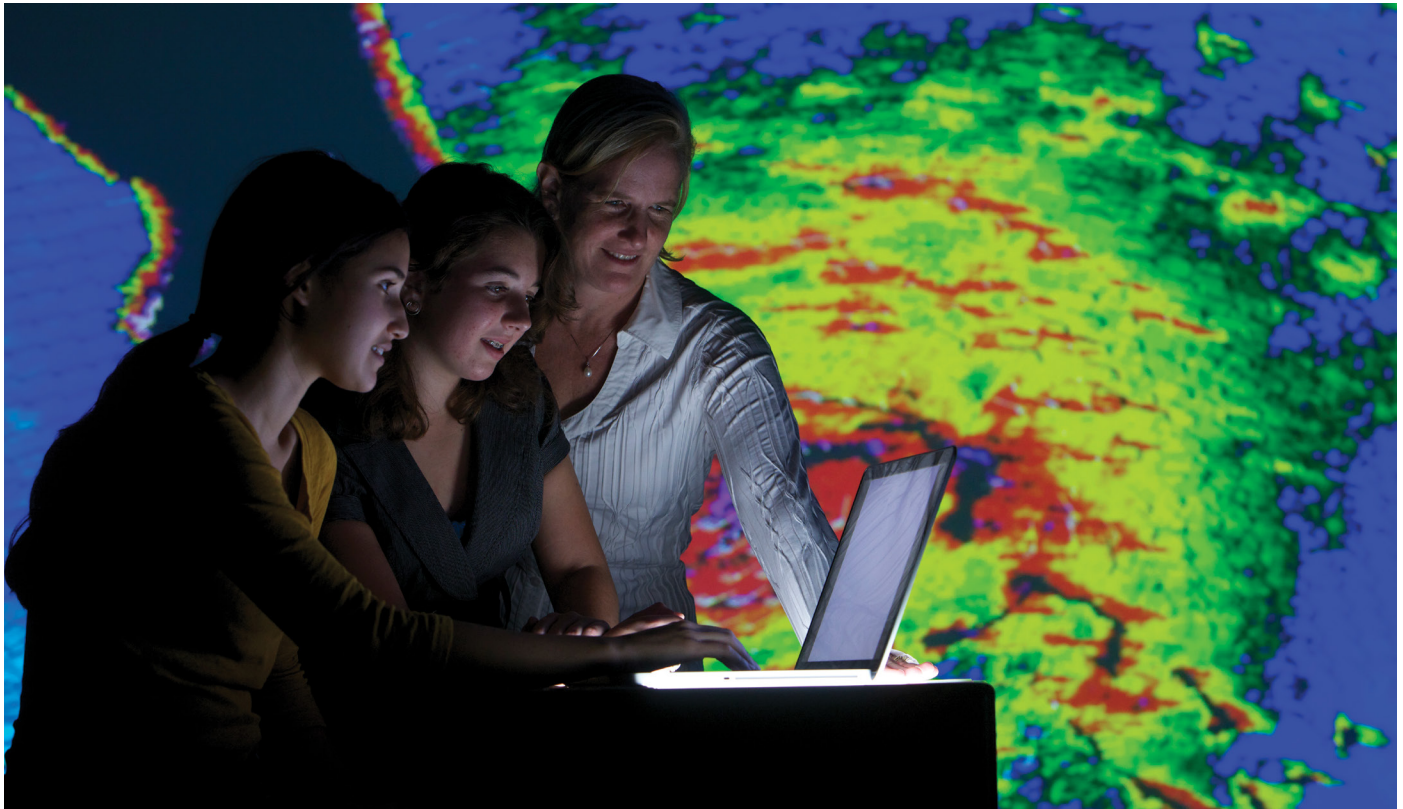
PHASE 4: CREATE
DEVELOPING GEO-INQUIRY STORIES

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Learn how National Geographic Explorers' work fits the Geo-Inquiry Process. Photograph courtesy of Mark Thiessen/National Geographic.

In this phase of the project, students will put the information they gathered and the data they analyzed into context using it to tell a Geo-Inquiry Story that answers their Geo-Inquiry Question. This phase of the Geo-Inquiry Process includes a set of activities that introduces Geo-Inquiry Stories, guides students through the process of storyboarding, and assists in tying all of the Geo-Inquiry Story elements together.

UNDERSTANDING GEO-INQUIRY STORIES
LEARNING FROM EXAMPLES

1. Have students review two National Geographic Geo-Inquiry Case Studies. Ask them to complete the Analyzing Geo-Inquiry Case Studies worksheet. Students will be asked to identify the elements they think work well in the story and the sections they find less effective.
2. Instruct students to create a list of elements important to a Geo-Inquiry Story, such as specific types of images, video tones, compelling storylines, or clear charts and graphs.

EXPLORING WAYS TO TELL A GEO-INQUIRY STORY

1. Have students briefly review some different ways and tools they can use to tell their Geo-Inquiry Story. Preview each one before sharing it with your students.
2. As students review the tools, have them analyze three of the tools using the Choosing the Way to Tell Your Geo-Inquiry Story worksheet. They will refer to this list later when selecting the tool they want to use to share their Geo-Inquiry Story.

PHASE 4: CREATE
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GEO-INQUIRY PROCESS RESOURCE PACKET CONNECTIONS

- Analyzing Geo-Inquiry Case Studies worksheet
- Choosing the Way to Tell Your Geo-Inquiry Story worksheet
- National Geographic Geo-Inquiry Case Studies
- Creating the Final Version of Your Map worksheet

PREPARING TO TELL YOUR GEO-INQUIRY STORY

Have students complete the Preparing to Tell Your Geo-Inquiry Story worksheet. This worksheet asks a series of questions designed to help students to reflect on their work plan for their Geo-Inquiry Story. Guide them through this process using the information below:

1. *What is your Geo-Inquiry Question?* Students should restate their question.
2. *What kinds of data did you collect?* Students should list the types of data they gathered, for example, a survey of teachers, video interviews with students, a map of school boundary lines, water quality over time, or time-lapse photographs.
3. *What did you learn from this data?* Students should summarize what they found from their data in relation to the driving question. The summary does not need to directly answer their Geo-Inquiry Question.
4. *How will you represent that data in your story?* Students should think about the most effective visuals they have created and if they need to edit or design new materials. They may include all of these elements in their story, but here, they should focus on the best ways to present their data.
5. *What is the answer to your question/proposed solution?* Students should explain the answer to their question or a proposal to answer the question based on their data and research. Encourage your students to explore if the proposed solution has spatial connections beyond the immediate locale, and if the solution is transferable to other communities.
6. *What action would you like to take based on your findings?* Students should tie what they found through the Geo-Inquiry Process directly to the action they wish to take and use it to framing their story. The action students are encouraging should drive their choice of audience. For example, if they are aiming for a change within their school, they might speak to their teachers, principal, or school board. If their solution requires a change in law, then their audience would be state or local government officials.
7. *What kinds of elements will be most important to tell your story?* Students should look beyond what they did during the project and how they will present their data, and think about how to frame the entire story. Ask: Can you tell your story effectively through narration or would it be better presented in text as a report, news article, or letter? Will you use video? photographs? infographics? maps? Will these tools be the focus of you presentation or will they be used as illustrations?
8. *What is the best tool to use to tell your story?* Students should return to their list of advantages and disadvantages of the various tools and consider which best matches the most important elements of their story. For example, if they want the bulk of their presentation to be image and sound, then their selected tool should make including images and sound easy or one that will give them more control over those resources. If they largely rely on text, they might choose a different tool.
9. *Why is this the best tool?* Ask students to verbalize why they selected a certain tool for their story to make sure they are selecting the best tool. If they cannot explain why a particular tool is a good choice, they should look at their options again.

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STORYBOARDING

OUTLINING

1. Introduce students to the Geo-Inquiry Story Rubric. Explain how they can use it as they create the Geo-Inquiry Story, and to assess their progress.
2. Have students create an outline of what they want to include in their story. This outline does not need to be very detailed but should provide the basic flow and important components of their story. They can refer to their answers to the questions in the Preparing to Tell Your Geo-Inquiry Story worksheet to help them create the outline. Students should keep the issue they want to take action on in mind as they design their Geo-Inquiry Story.

CREATING A STORYBOARD

1. Explain that storyboarding is a process used to plan a multimedia product. Storyboards are used for the creation of animations, video games, videos, and multimedia presentations.
2. Have students examine the Geo-Inquiry Storyboard worksheet. This worksheet provides a place to organize visual, audio, and text elements of their Geo-Inquiry Story. Explain that one frame of the storyboard represents one scene, slide, or component in their presentation. Discuss the information students should include for each section.
3. Scene box: Students should number each scene or component of their story. In the box provided, they should loosely sketch what that section will look like. This sketch is a draft and should show the basic visual elements (text, image, chart) that will be on the screen.
4. Description: Students should specifically describe the visual elements they want to include. For example, they may write: "Image of the front of the school with text box beneath," "chart showing water quality data," "map of the river with map key on right," or "video of the interview with Mayor Smith."
5. Text or narration: Students do not need to put the full text into the storyboard but can briefly describe what should be covered in that scene. For example, they may write: "why this question is important." If there will be separate text boxes on the screen, students can indicate this with numbering. For example: "Text 1: Geographic question. Text 2: why this question is important."
6. Audio: If there will be sound (music, narration, or sound effect) playing while on this screen, students should indicate it here and describe it briefly. They do not have to write out a full script.
7. Length: If students know the length of narration/background music, they should note it; but if they are not yet sure, they may leave this part blank. They should consider how long it would take someone to read on-screen text or if the viewer would be scrolling through the story at their own pace, in which case length is unnecessary.
8. Transition: Students should include this if they want a unique transition, such as a fade, between scenes.
9. Other: Students should add any notes they want to make to themselves about the scene or any additional elements they want to include.

ASK COLLECT VISUALIZE CREATE ACT

**GEO-INQUIRY
PROCESS
RESOURCE PACKET
CONNECTIONS**

• Geo-Inquiry
  Storyboard worksheet

10. Have students use the Geo-Inquiry Storyboard worksheet to plan their Geo-Inquiry Story, based on their outline. As students work, they should reference existing images or video and incorporate them into the storyboard.

11. Have groups exchange storyboards, review the other's work, and offer constructive feedback. They can organize their feedback with the peer-review form in their workbooks.

12. Once groups receive peer feedback, they can adjust their storyboards as needed. Collect and review students' storyboards before they resume creating their story.

COLLECTING AND CREATING STORY ELEMENTS

NAMING AND STORAGE CONVENTIONS

1. Before students begin assembling the elements they will use in their Geo-Inquiry Story, they should come up with naming conventions and a storage plan. For example, they may want to start each image and graphic file name with the number of the scene in which it will be used (e.g., 1_school front or 5_density map). For sound files, it may also be helpful to include the length of the clip in the file name (e.g., 3_Smith interview_2_20). Encourage students to keep file names simple but descriptive. Groups should also decide if they want the text and/or narrative script to be in separate files for each scene or just as one document clearly labeled with the appropriate numbers.

2. Ask students to determine how they will organize their files. They may want to create a folder for the files or paste them into a word processing document. No matter the method selected, students should ensure all group members have access to the assets, even from home. Students may organize materials using folders for each element type or scene and may want to keep original and edited images and video separate so the final version is clear. Give students examples of naming and organizing conventions, but let each group agree on a system.

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ASK   COLLECT   VISUALIZE   CREATE   ACT

CREATING SPEC SHEETS AND ASSIGNING TASKS

1. Using their Geo-Inquiry Storyboard worksheet as a guide, students should create a master list of images and video. If students already have the materials for a scene, they should write the file name on the list. If they need to capture the image or video, they should instead list the specifications. This should include a specific description of the shot they want, as well as orientation (vertical or horizontal), and in the case of video, approximate length. Students can use the charts provided in the Tracking Geo-Inquiry Story Elements worksheet to compile this information and track progress.

2. Students should follow the same process to create a master list of graphic elements including charts, graphs, maps, or tables. If they still need to create it, they should be specific about what they need to create, including the type, orientation, and color scheme.

3. Using their Geo-Inquiry Storyboard worksheet as a guide, students should list all the text and narration elements they will need in the Tracking Geo-Inquiry Story Elements worksheet. This can include the topic and a rough idea of the text/script length.

4. Ask students to assign tasks to group members and establish a timeline. At this point, students should write text and scripts; collect audio; edit photographs, videos, and text; create or finalize graphic elements; record narration; and take and edit additional photographs or videos, if needed. Groups may decide to have one member in charge of each type of element, divide scenes among members, or create their own assignment method. Students should write the assignments down clearly and turn them in before beginning work. Review groups' assignments and ask for a revision if the workload seems to be distributed unevenly or unfairly.

PHASE 4: CREATE
DEVELOPING GEO-INQUIRY STORIES

ASK — COLLECT — VISUALIZE — CREATE — ACT

GEO-INQUIRY PROCESS RESOURCE PACKET CONNECTIONS

- Tracking Geo-Inquiry Story Elements worksheet
- Taking Photographs and Videos handout
- Geo-Inquiry Story Rubric
- Geo-Inquiry Storyboard worksheet

TIPS FOR EDITING IMAGES, VIDEO, AND AUDIO

1. There are a number of free editing programs available online and most computers come with a basic image, video, and audio editing software. Think about your students' capabilities as well as their timeframe when selecting editing tools, as some tools are more simple, while others allow more flexibility and greater control but take more time. You may want to select both a simpler and more advanced editing tool for each asset type (audio, video, and photograph) to accommodate a variety of skill levels.
2. Familiarize yourself with the tools you will introduce to students. You need to have enough knowledge about the programs to assist them with basic troubleshooting.
3. If students already have software preferences, you can allow them to use it instead, though this can be problematic if students run into problems with the program and you are not familiar with it and cannot help them troubleshoot.
4. If the programs you select require a download, make sure to install them on multiple computers, so several groups may work simultaneously.
5. If students are not familiar with the editing tools, give them a brief tutorial or instruct them to watch an existing tutorial.
6. If your school has a technology coordinator, consult them, as they may be able to help you with this process.
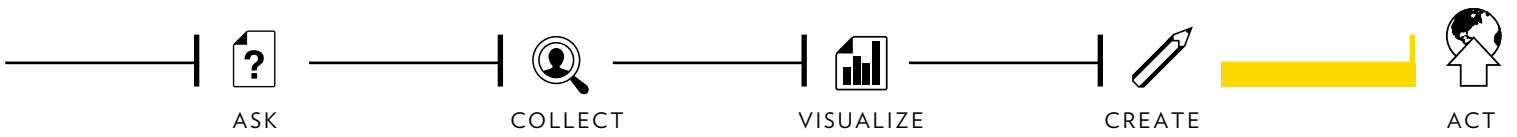
COMPLETING THE GEO-INQUIRY STORY ELEMENTS

1. Ask students to begin working on their assigned tasks. Tips for taking and editing photographs and videos can be found in the Taking Photographs and Videos handout.
2. Text and scripts should be reviewed and edited by a group member other than the original author.
3. As the elements are completed, group members should review them for mistakes and suggest revisions.

PUTTING IT ALL TOGETHER

1. Using their Geo-Inquiry Storyboard worksheet as a guide, ask students to put their audio, text, graphic, image, and/or video elements into the selected storytelling tool. Some elements may need to be revised, so be sure to give students ample time to complete this step.
2. Once their elements are in place, groups should review their entire Geo-Inquiry Story using the Geo-Inquiry Story Rubric and make any adjustments needed.
3. Once groups are satisfied with their Geo-Inquiry Story, have them exchange their story with another team who should review the story using the rubric and provide constructive feedback. Students should revise their story as needed based on peer feedback.
4. Review each group's Geo-Inquiry Story and make any final suggestions for revision.

PHASE 5: ACT

SHARING GEO-INQUIRY STORIES

ASK   COLLECT   VISUALIZE   CREATE   ACT

PHASE 5: ACT
SHARING GEO-INQUIRY STORIES

ASK — COLLECT — VISUALIZE — CREATE — ACT

A student presents to an audience. Photograph courtesy of Monkey Buisness Images/Shutterstock.

GEO-INQUIRY PROCESS RESOURCE PACKET CONNECTIONS

- Developing an Action Plan worksheet
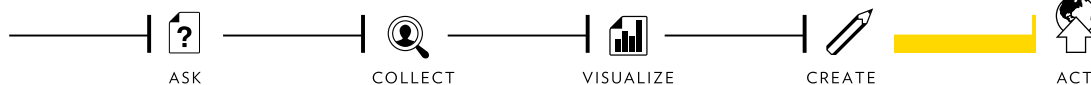- Choosing the Way to Share Your Geo-Inquiry Story worksheet

The final step in students' projects is to share their Geo-Inquiry Story and to use their stories to take action. The activities in this section guide students through exploring the best way to present their work, identifying their audience, and, finally, sharing their story and reflecting on the process.

PREPARING TO SHARE

1. Have each group share the action or issue they would like to raise awareness for using their Geo-Inquiry Story. Even if the class is working on the same Geo-Inquiry Question, this can be a way to help students describe their findings into their own words.

2. In Phase 4, students described the audience they wanted to reach with their Geo-Inquiry Story. Have students revisit this now. Ask: *Is this still the best audience for the action or issue you want to raise awareness for? Are there additional people you should target?* Have students answer the questions in the Developing an Action Plan worksheet. They may need to conduct additional research to answer all the questions. This process should help them solidify the action or solution they are proposing, as well as its advantages and disadvantages. It should also help them to identify who they have to convince to have their proposal enacted and highlight their best arguments.

3. If students will select their method of sharing their Geo-Inquiry Story, briefly introduce them to some ways they might present their story to an audience. Have groups brainstorm additional ideas. Students can track preferred methods with the Choosing the Way to Share Your Geo-Inquiry Story worksheet.

4. Ask students to consider their issue, audience, and story, and select a presentation method. In some cases, you might want to select one method in advance or to limit students' options.

PHASE 5: ACT
SHARING GEO-INQUIRY STORIES

ASK — COLLECT — VISUALIZE — CREATE — ACT

WAYS TO SHARE A GEO-INQUIRY STORY

WEBSITE
Students can use a free web application to create a web page to host their Geo-Inquiry Story. These platforms are often so simple to use that students will be able to create their Geo-Inquiry Story without any specialized knowledge. Students can include text, audio, and/or images to introduce and create context around their Geo-Inquiry Story to take action. They can also include links or contact forms to encourage further audience action. Websites are easily accessible by anyone, and a good choice if the audience is unable to gather for a live presentation. However, students should be particularly cautious about copyright and permissions when creating a public website.

WRITTEN PRESENTATION
Students can write an introduction to their Geo-Inquiry Story, explaining the importance of the subject, and describing the action they hope their audience will take. This write-up can be sent to their audience along with the Geo-Inquiry Story.

POSTER SESSION
Groups can create poster displays using text, images, and artifacts to contextualize their Geo-Inquiry Story and explain their call to action. Students can set their poster presentations up in one room and designate a time when visitors can tour the displays and ask questions about their projects. Students should write talking points in advance and practice asking each other questions about their projects before the day of the poster presentation. This is a low-tech presentation solution that can be completed more quickly than digital presentations.

EVENT
In some cases, students may want to organize an event where they can share their Geo-Inquiry Story. For example, if their story leads to taking action for water pollution, they may want to organize a cleanup day at a nearby stream. They can share their Geo-Inquiry Story and explain why they think it is important to kick off the event.

DEVELOPING AND DELIVERING PRESENTATIONS

1. Share the Geo-Inquiry Presentation Rubric with students.
2. Review the information in the Storytelling: The Basics handout.
3. Have students develop their presentations using the Planning Your Presentation worksheet. Though the delivery method students use will vary, all students' presentations should have those basic components.
4. Students should also review the planning chart in the Planning Your Presentation worksheet they created to track assignments, responsible parties, and delivery dates for their presentations.
5. Have students use the Peer Review form to assess the other groups' presentations.
6. Finally, have students share their Geo-Inquiry Stories and follow up as needed to implement their action or solution.

PHASE 5: ACT
SHARING GEO-INQUIRY STORIES

ASK — COLLECT — VISUALIZE — CREATE — ACT

GEO-INQUIRY PROCESS RESOURCE PACKET CONNECTIONS

• Geo-Inquiry Presentation Rubric
• Storytelling: The Basics handout
• Planning Your Presentation worksheet

TIPS FOR LIVE PRESENTATIONS

• Have students create a typed presentation script using large, easily readable font. Ask them to divide the script into easily identifiable sections. Students should distinguish each section with a number, color-coding, or they may print each part on a separate page.
• Give students ample time to practice. The more they practice, the more confident they will be in front of an audience.
• After practicing their presentations some students may be comfortable enough to use prompts rather than a script for their speech. This can help them look down less often and can make the speech sound more natural.
• As students practice, instruct them to focus on different aspects of presentation, such as projection, enunciation, emphasis, body language, and making eye contact with the audience. As novices, students need to be made explicitly aware of all the skills involved in a good presentation. If you have the time, introduce these after students have gained some confidence with the language of their speech.
• Make sure students have at least one "dress rehearsal," where they can test any technology they will be using.
• If possible, record students giving their presentations so they can self-evaluate.
• Have students use the Peer-Review worksheet to provide feedback on their classmates' speeches.

PHASE 5: ACT
SHARING GEO-INQUIRY STORIES

ASK — COLLECT — VISUALIZE — CREATE — ACT

INVITING THE AUDIENCE

- Students will need to determine the best way to let their intended audience know about their Geo-Inquiry Story and their proposed action or solution. This will depend on how they plan to present their Geo-Inquiry Story.
- For any live or poster presentation, you will need to make advance arrangements to host the event. Students must consider their audience, available resources, and their availability to determine the best time, date, and place for the presentations. Once these are set, students should issue invitations to their target audience. They can create actual invitations or send an email or letter to attendees. Students may also want to create an invitation using an online invitation tool to make it easy for guests to RSVP.
- If students will not be presenting live, they will need to determine the best way to inform their target audience. Students should not email attachments to people they do not know. For this reason, it is easiest if students' work can be hosted privately on a school website. Students can then send a link to their presentation along with an introductory email or letter directly to the people they hope to reach. If students created a public website, they can share the link directly with their audience through email. They can also share the link more widely via social media (as age appropriate), flyers, or other methods.
- If sending an attachment is the only option students have for sharing their presentation with a particular audience, they should first send an introductory email briefly explaining the project and ask for permission to send an attachment.

ASSESSMENT

Use the rubrics in the Geo-Inquiry Process Resource Packet to assess students' Geo-Inquiry Stories and presentations. Share the rubrics with students before they begin work on each item. Peer-Review, Self-Evaluation, and Ongoing Reflection forms are included.

REFLECTING ON THE LEARNING

1. Have students complete the Final Reflection form. This includes writing prompts to help students identify what they are proud of, what they would have done differently, what they learned, and how they might apply that learning in different areas.
2. Have students complete the Self-Evaluation form.
3. After students have had time to reflect in writing, discuss the project as a class, using the reflection prompts as starting points for discussion.
4. Discuss any follow-up actions students will take, including ways to track their influence on the problem or issue.

CREDITS

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