LANDSCAPE INVESTIGATION GUIDELINES

Challenging 4-12 Students to Engage in Social Science Inquiry by Applying Spatial Thinking to Real World Situations

Developed by Pacific Education Institute
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PREFACE

Welcome! This resource is the next generation of a product that was created by the Association of Fish and Wildlife Agencies in the early 2000's. The Education Working Group of the Education, Outreach, and Diversity Committee received a multi-state grant in 2020 to update this resource and several others from the North American Conservation Education Strategy toolkit and make it relevant to educators today.

This resource is an update to the work of generations of wildlife educators from across the country. We honor their work by updating, not replacing, this incredibly useful resource that can be used by conservation educators and classroom teachers across North America. A sincere thank you to everyone who created the original resource as well as DJ Case & Associates who brought this resource into the current era of education.

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INTRODUCTION: A RATIONALE FOR LANDSCAPE INVESTIGATION

While some social studies teachers have minor degrees or experiences in social science fields other than history, the underpinnings of most social studies educators are history-related. History gives students a context for discussing issues and information. Social science teachers must take these lessons further and not only relate the past to the present, but also teach students to examine the human dimension unfolding on the landscape. The understanding that develops from this avenue of study will prepare students to shape the future of their communities through their choices and actions as stewards.

In 1993, I spent a month at the National Geographic Society's headquarters, where I received training on how to infuse geographic principles and processes into my classroom. Under the tutelage of Christopher Salter, professor of geography at the University of Missouri, I conducted fieldwork through a process entitled OSAE (Observation, Speculation, Analysis, and Evaluation). Using this technique, Dr. Salter took us on field walks in Washington, DC.

The experience resonated with me because it was similar to experiences I had as a child while on vacations and outings with my family. My father, a college geography teacher, felt it important that we be able to "read the landscape." Later, during the early days of my teaching career, I took kids into the field; but I lacked a proper structure and framework to give students the tools to construct meaning from what they were experiencing.

Enter landscape investigation. For the past decade, my geography work has involved helping teachers and students alike to learn, as my father put it, "to read the landscape." My goal has been to give teachers and students the tools to analyze a local, human-built environment so they can see the world through different lenses within a spatial dimension. To see the world in spatial terms means to be able to apply a sense of spatial organization to any environment.

Teachers and students need to understand what spatial organization is and why it is so important. I have also, with spotty success, tried to educate politicians, policy makers, and "barrier" bureaucrats. The spatial organization of human activity is at the heart of landscape investigation. I feel students who go through the experience will have both a greater understanding of the social world and the higher-level thinking skills to deliberate on environmental issues and to make choices and take actions that will truly make a difference.

After conducting geography field studies with students and teachers in Washington state and in places like Costa Rica and Belize, I teamed up with Dr. Margaret Tudor and Lynne Ferguson of the Pacific Education Institute to create an improved structure for this social science field experience.

It was Lynne who coined the term landscape investigation. Together, we created this manual to give teachers the tools to help students in the field both experience a sense of the changing human dimension on the landscape and evaluate that changing world.

Use this information and the process skills embedded in landscape investigation to prepare students for the world beyond the classroom, a world where a deeper sense of the issues and a better understanding of the environment requires students to be stewards of their future and take action on behalf of their world.

Michael Papritz, September 1, 2009

CHAPTER 1:
METHODS FOR SPATIAL THINKING THROUGH GEOGRAPHIC INQUIRY

Using Landscape Investigation to Understand Spatial Organization

The World in Spatial Terms is the beginning of geography; if we study the relationships between people, places, and environments, then we must do so by mapping information about them into a spatial context.

– National Geographic's Geography Standards for Life

As humans leave their footprint—whether physical or chemical—on the earth's surface, they trigger ongoing changes and interactions in the natural world. For example, when humans set up a dike system in a flood- prone river valley, they alter the way the river rises. A consequence of raising the banks along the river is that little to no flooding will occur in the valley. If the valley once flooded on a yearly basis, and the flooding used to provide fertile lands for farming, another consequence of the dike system may be that, over time, the land in the valley will be used for human activities other than farming, such as for housing developments or distribution centers for goods and services. To explore the wider range of consequences, a researcher might also ask how flood-proofing this valley affected adjacent areas and whether change is likely to occur over time in those areas because the valley no longer gets flooded.

When students engage in landscape investigation, they explore the spatial dimension of an area such as the river valley just described. The spatial dimension involves both space and place. A space is a given location; place refers to the way in which a space (location) is altered over time and defined in terms of relationships that are meaningful to humans. Consider again the example of the dike system in a river valley: It has a "spatial structure" because it can be understood both as a space (location) and as a place (a place altered and defined in various ways over time). The valley and adjacent area is our place; by projecting consequences that affect the interrelated elements of that place over time, we begin to see its spatial dimensions.

To apply the landscape investigation model, students and teachers engage in a hands-on investigation of the spatial structure of their own community. Students develop an understanding of the juxtaposition of space and place, expressed as spatial organization or spatial relationships: As they investigate an area, the students record the information they gather and work to interpret the data as it relates to the area's place, to other interconnected places, and to changes that have occurred or may yet occur over time. They use representation tools—including map-making, journaling, and spatial data (GIS) —as the means to ground-truth and document the circumstances that they observe on a daily basis. To use these tools and grapple with the circumstances of their study area, students must learn to process information at a higher level and apply reasoning skills. By investigating circumstances in the landscape, they deliberate on the relevance of their human-environment case study. This powerful experience exceeds textbook activities by bringing geography to life.

"Landscape investigation is important because it brings the learning in full circle. We discuss terms and read examples from the book but when you see an example first hand it makes everything much more clear."

– Kayla, Student

Students gain a greater cognitive understanding of the world by starting in their own region. Through the investigation, the students construct meaning from the circumstances under study. Ultimately, the students gain a firm understanding of the economic, historic, socio-cultural, and ecological worlds of their everyday lives. By learning to consider spatial structure, they learn to identify and understand the wider consequences of changes to the landscape and the systems that interact with it. This means they will be in a better position to predict outcomes and make informed decisions.

On the Relationship of History to Geography and its Spatial Dimension

Geography and history are both beneficiaries of spatial and locational concepts. This is illustrated with examples regionally as well as globally. As a historian, Edward Cook undertook a critical review of the insights that historians gain from a "heightened sense of the spatial dimensions of their studies." Cook wrote, "A first step in the application of geographic thought to history is the simple but unfamiliar one of approaching problems with spatial influences as clearly in mind as those of time and cultural institutions." He noted that, "A key part of the geographer's procedure involves asking each source how its data would look imposed on a map of the area in question." This approach to interpreting history is not new; the methodology, however, with its natural integrative role, has slipped away into a more social studies discipline. This poses the question "where and how will students gain an integrated understanding of their world in a jam-packed curriculum?"

Cook cites and praises work on colonial American studies by geographers like Carville Earle, H. Roy Merrens, Cole Harris, and James T. Lemon. He notes with approval, "The emphasis which they all (three) placed on aerial differences and on spatial relations in their understanding of the periods and places they are studying."

Specifically, Cook critically considers the extent to which early American history was illuminated through the application of "locational theory" in general and of "central place" theory in particular, referring to work by geographers including James Vance Jr., Michael Conzen, Robert Mitchell, and Allen Pred. Cook states, "Implicit in the view of geography as a strategy for thinking in spatial terms is its usefulness in a wide range of historical situations" (Cook 1980, 20, 23).

History plays a prominent role in understanding the place and space in which humans conduct their activities on the landscape. A field study approach, such as landscape investigation, considers the history by applying the spatial organization to social studies courses.

Cook and others' work in historical geography gives teachers a chance to pause. The integration of these social science pieces fit together beautifully like a "meaningful" puzzle that students in the K–12 education system sorely need to experience.

- Michael Papritz

How to "SEEH" the Landscape" Through Spatial, Ecological, Economic, and Historical Lenses

Understanding spatial organization on the surface of the earth is at the heart of landscape investigation, but the bigger question is, "How do teachers and students adopt this approach so that they truly grasp the process of investigating the human-built landscape?" The answer is to draw on the other social science disciplines that have an ongoing and meaningful connection to geography. By incorporating the perspectives of these other disciplines, students and teachers will be able to "SEEH" and understand the spatial organization of the area they investigate.

The "S" in SEEH stands for spatial, the application that geographers use to orient themselves—how they see the world. The first "E" stands for the ecological, the playing field upon which students and teachers observe the interactions, modifications, and alterations that occur between humans and the environment. The second "E" stands for economic. Most decisions that impact the landscape were economically motivated and have various economic ramifications—the type of ramifications that are important to our understanding of our dynamic world. Lastly, the "H" stands for historical, the agent that creates our overall perception of the importance of space and place and explains the forces that have shaped our present.

This approach brings together the overarching idea of spatial organization to address considerations such as ecological change, economic decisions that leave an imprint on the landscape, and the relevance and long-lasting effects of past events. By observing the spatial interplay in an ecological, economic, and historical way, students come to ask questions related to the ongoing interactions of these social and natural systems. This leads students to reason through the complex issues of our society and to develop a much deeper understanding of the world. From that informed and thoughtful position, students can then take action on the issues that are at the core of our local, regional, national, and international communities.

"Landscape investigation helps us understand and connect the specific terms we learned about in our readings to real life examples in our world. More specifically it connects our reading to a local example which really helps you get a better grasp on the content."

–Avery, Student

Natural and Social Science Inquiry in the Field

If they are to investigate an area and develop an understanding of the spatial, ecological, economic, and historical dynamics that affect it over time, teachers and students must adopt a systematic methodology to direct their inquiries. In contemporary workplaces, such as natural resource agencies, where decisions about land management are made in accordance with agency mission statements, social science inquiry works hand-in-hand with science inquiry. It is essential to understand the relationships between human systems and natural systems when making decisions that affect both.

Given these realities, the education of future natural and social scientists and citizens alike ought to include the full range of science inquiry methodologies, including social science inquiry. Currently, how social science is implemented in K–12 schools varies considerably. Most students do not experience the social science inquiry conducted by professionals in the field. In many cases, inquiry in schools is limited to the type of science inquiry conducted in a laboratory setting. The work of Windschitl et al. (2007) describes the limitations of teaching only one methodological approach to natural and physical science inquiry and provides a framework for conducting inquiry in contemporary field settings. This effort to define inquiry methodologies for field investigations has made it all the more necessary that students develop similar abilities in social science inquiry.

The landscape investigation model provides educators and their students with a framework and methodology for conducting geographic and social science inquiry in conjunction with natural science field inquiry. The model is designed to not only ensure an academically rigorous approach to learning, but also to facilitate the development of skills and behaviors that students need to become complex thinkers and informed decision-makers. In particular, this approach to place-based inquiry encourages students to address the study of human systems and their effect on natural systems from various perspectives.

> *"Landscape analysis helps you figure out why a city is the way it is. You can learn a lot about an area through landscape investigation from why the name of the city is what it is to what the main source of income for the area might be. It's a really good tool to have when learning about human geography."*
>
> *–Joey, Student*

Beginning with Natural Science Inquiry: Field Investigation

Classroom science often overemphasizes experimental investigation, a type of inquiry in which students actively manipulate variables and control conditions. As the name suggests, experimental investigation relies on controlled experiments: The scientist begins with a hypothesis about links between variables in a system. The scientist then identifies variables of interest and designs a "fair test" in which variables are actively manipulated, controlled, and measured to gather evidence to support or refute a causal relationship.

When studying the natural world, it is difficult to manipulate variables and maintain "control" and "experimental" groups, so scientists who conduct field investigations look for descriptive, comparative, or correlative trends in naturally occurring events. Many field investigations begin with counts (gathering baseline data). Later, measurements are intentionally taken in different locations (for example, urban and rural, or where some natural phenomenon has created different plot conditions), because scientists suspect they will find a difference.

Table 1: Three types of inquiry for conducting natural science field investigations.

Field Investigation Framework		
Descriptive field investigations involve describing and/or quantifying parts of a natural system.	Comparative field investigations involve collecting data on different populations or organisms, or under different conditions (e.g. times of year, locations) to make a comparison.	Correlative field investigations involve measuring or observing two variables and searching for a relationship. GIS is used to simplify the statistical analysis to determine correlations.

Different types of questions guide each type of field investigation. Descriptive studies can lead to comparative studies, which can lead to correlative studies. These three types of studies are often used in combination to study the natural world. For field investigations to be relevant, the conclusion must include inquiry from the social science disciplines. These perspectives are obtained through social studies inquiry.

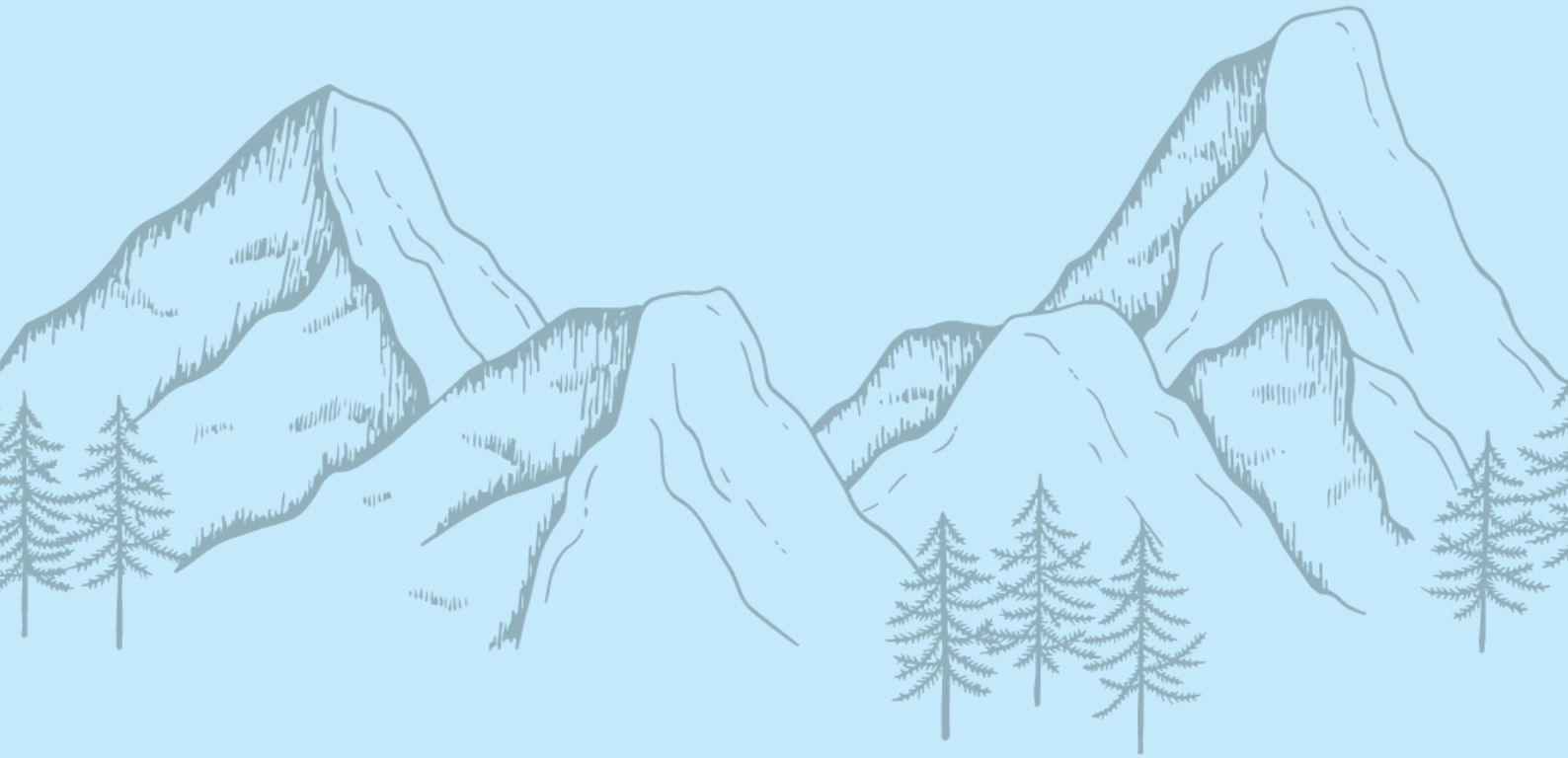
Social Science Inquiry: Landscape Investigation

The Landscape Investigation methodology follows a framework similar to that used for field investigations (compare Table 1 to Table 2). It begins with Spatial Inquiry, which introduces students to geographic spatial thinking and identifies elements of focus: spatial, ecological, economic, and historical geographic perspectives. With further inquiry, the researcher (student) may ask deeper questions, look for connections between the geographic perspectives while in the field collecting qualitative evidence of the interplay between human and natural systems; this is the Connective Inquiry.

Typically, researchers interested in managing human-related aspects of a location will want to look more closely at the relationship between features in the physical and human dimensions and gather quantitative data. The relationships between variables can be investigated through Analytical Inquiry (for example, where people live in relation to rivers and streams).

Social science inquiry, in conjunction with geographic inquiry, focuses on both natural features and human elements to understand the implications (or "so what") of natural science studies (Windschitl et al. 2007). The Landscape Investigation helps students in the middle and high school years develop their higher-order thinking processes by guiding them to analyze critically and draw connections between the disciplines of geography, history, economics, and environmental science. Additionally, a geographic inquiry approach is especially beneficial for students who need to visualize and apply their work in the sciences. To see examples of Landscape Investigations completed by students and adults, see Appendix B.

The National Research Council reports the lack of spatial inquiry in schools today (NRC, 2006). Chapter Two of this guide introduces students to some of the tools and skills they need to conduct landscape investigation through spatial inquiry.



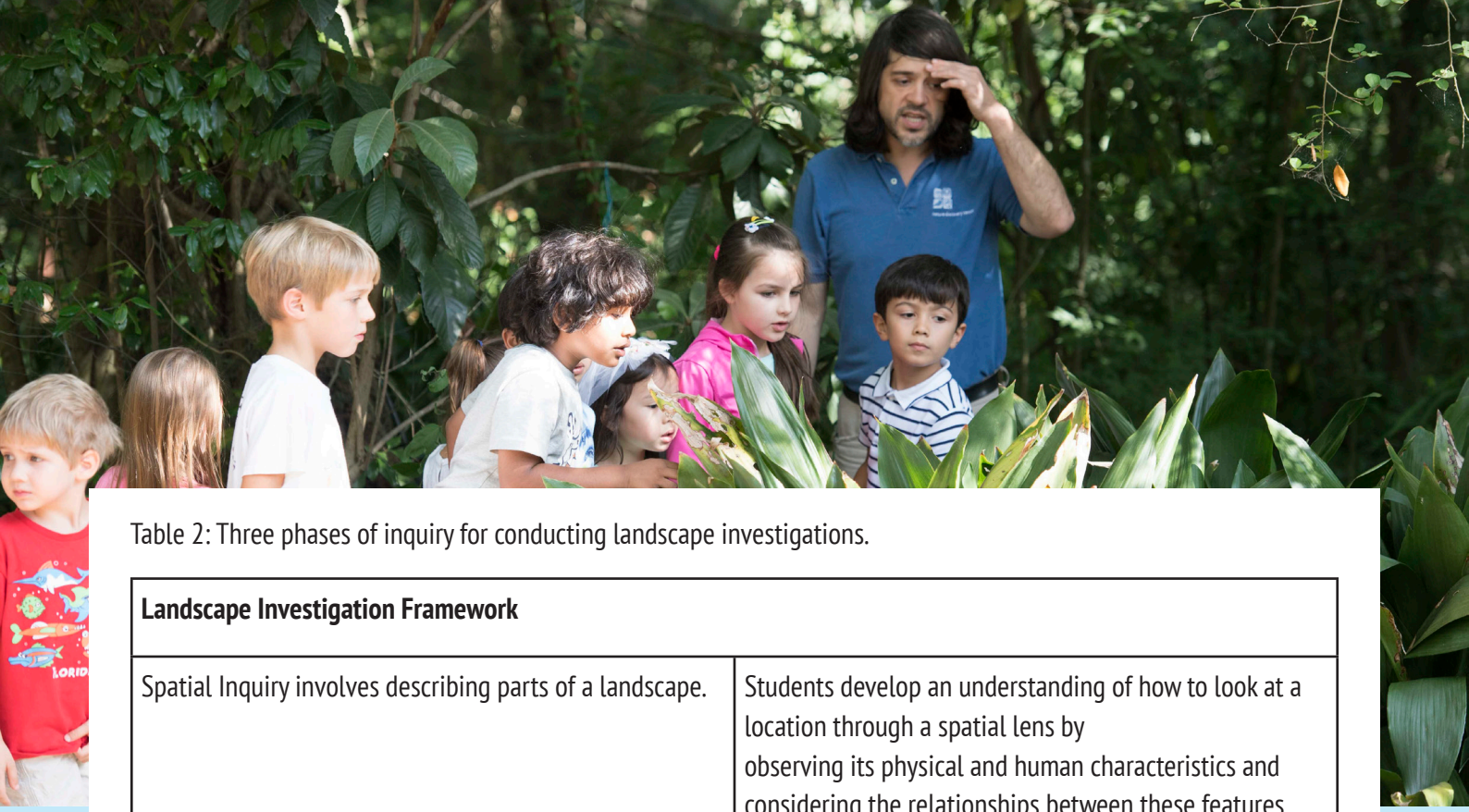


Table 2: Three phases of inquiry for conducting landscape investigations.

Landscape Investigation Framework	
Spatial Inquiry involves describing parts of a landscape.	Students develop an understanding of how to look at a location through a spatial lens by observing its physical and human characteristics and considering the relationships between these features.
Connective Inquiry involves collecting data on evidence of interplay between human and natural systems from multiple geographic perspectives.	Using Spatial Inquiry skills, students research a location and form questions, then predict and gather data about the location through a field experience – making observations, interviewing community members, and collecting data. Students use the observations and data to consider the connections, patterns and trends related to the spatial, economic, ecological and historical perspectives. They summarize their findings and reflect on how the connections between the perspectives of a location can reveal its story.
Analytical Inquiry involves quantitative analysis of two or more variables that the researcher hypothesizes are related.	This is the highest level of geographic inquiry: Once the foundational geographic skills are in place, students ask larger questions that are community-related social science questions. Using a Geographic Information Systems (GIS) laboratory, students ground truth their predictions, collect Global Positioning System (GPS) points of data, and undertake a GIS analysis to look for correlations between geographically linked data sets. This type of geographic inquiry allows students to define a problem or propose solutions.

The landscape investigation model identifies three sequential inquiry processes: First is a Spatial Inquiry. This is followed by a Connective Inquiry in which students delve deeper into aspects of interest. The process culminates in an Analytical Inquiry: Students work to derive meaning from their observations by interpreting the data.

Basics of Landscape Investigation

Landscape Investigation is, at heart, a simple concept: Get students into a landscape to explore, discuss, question, and discover. Students learn geographic principles and perspectives as they first develop a basic spatial understanding and then strengthen that knowledge as they conduct an in-depth investigation about the human connections to and perceptions of a place. As you explore the possibilities of landscape investigations, you will put into practice a sequential process beginning with Spatial Inquiry to establish variables on the landscape, followed by Connective Inquiry to find connections between those variables from various perspectives and culminating with Analytical Inquiry, the qualitative analysis of the relationships between variables. The field study can take place both during spatial inquiry and connective inquiry phases with classroom preparation beforehand. During field studies, students get outdoors directly interacting with community members and the environment.

This core process involves students in:

- Selecting a location (with manageable boundaries for student exploration) where natural and human built environments interact.
- Collecting various maps and information as they develop an understanding of the characteristics of the location.
- Preparing for a trip to the location (Field Study) by considering observation strategies and developing questioning skills.
- Visiting the location as teams (with "walker only" chaperones) for 2-3 hours, and attempting to answer the question: What is the story of this place? By collecting raw data through interviews and artifacts (photos, brochures, historical papers, etc.), the students examine the Spatial, Ecological, Economic and Historical (SEEH) perspectives of the location related to the focus question.

Spatial Perspective:	What features, patterns, and relationships do you see in this location?
Ecological Perspective:	What connections to and impacts on the environment are present in this location?
Economic Perspective:	How might the economics within the area affect the features/characteristics of that location?
Historical Perspective:	How has this location changed over time?

- Evaluating and communicating their findings - looking at connections between the perspectives and asking new questions to explore deeper.

Whether you wish to provide students with a general introduction to spatial understanding or guide them through an in-depth study of a location, please use the Landscape Investigation Guide in the way that fits best for your classroom and students. See Appendix B for examples of this core process.

How to Use this Document

Activities in this document are for those wishing to demonstrate connections between the social and natural sciences using a geographic lens. The activities follow a progression from novice to intermediate to advanced learner.

Novice Learner	focus on Spatial skills	Anticipated grade level 4-5 Chapter 2
Intermediate Learner	focus on Inquiry	Anticipated grade level 6-7 Chapter 3
Advanced Learner	focus on Connection	Anticipated grade level 8 and up Chapter 4

Class times for these activities will vary depending on the number of students, learning levels, and learning styles. We suggest that activities be given time for reflection and discussion as time is available. Estimated times are provided for each activity.

With rapidly changing technology and handheld mapping devices in almost every student's hand, there are many ways to include new technology in these activities. Throughout, when appropriate, suggestions for the use of programs such as Google Maps, Google Earth, GIS, Geolocation of images, and others are listed. Teachers should feel free to incorporate technology in these activities for their individual classes.

Each activity includes an easy-to-use box for quick reference to: Learning level for the activity, NGSS Standards, NCSSS Standards, Objectives, Materials, Approximate class time, and Technology options.

CHAPTER 2:
BUILDING SPATIAL SKILLS

Overview

The Landscape Investigation process requires students to read maps, analyze artifacts and images, distinguish patterns, and determine relationships between the physical and human components within a location. To be successful, students must have a general understanding of maps, as well as the physical and human components depicted through maps, images, and artifacts.

Through the two-step Building Spatial Skills process, students develop the basic skills to read and interpret maps, images, and artifacts as they gain a spatial understanding of the physical and human components of a familiar location: the school campus.

Students first create maps of their school campus while identifying spatial features such as distances, directions, patterns, and arrangement. Then, through deeper analysis and the interpretation of maps, images, and artifacts, students build their understanding of the physical and human components that make a campus a place.

The skills and geographic spatial thinking developed during this process will be used and enhanced throughout the three phases of the Landscape Investigation.

<u>Process</u>

Step 1	Understand Space Students develop mapping skills and understand the geographic meaning of space as they research, experience, measure, and document the locations, distances, directions, patterns, shapes, and arrangements while creating maps of the school campus.
Step 2	Define Place Students read and interpret various information sources, ranging from historical maps to aerial photographs, as they explore the relationships between physical and human components of the campus.

Prior Knowledge: Reading and Interpreting Maps

As classrooms prepare for social science geographic inquiry, the more prior experience students have reading and interpreting maps, the better. However, if this is students' first exposure to maps, or if they have had few opportunities to read and use maps in the classroom, it can be helpful to spend some time orienting students to the key components of different maps and how to read them.

Students should be able to look at a map and describe:

1. Orientation: What is located north, south, east, and west of a particular point on the map?
2. Legend: What are the symbols, lines, circles, and other shapes that represent what you will find in that place (human and natural features)?
3. Scale: What is the unit of measurement on the map that equals a distance on the land? What is the distance from Point A to Point B?

Step 1: Understand Space

Learning Level
Novice Learner

NGSS Standards
305-ETS1-1 Engineering Design
5-ESS2-1 Earth's Systems

NCSSS Standards
Theme 2: Time, Continuity, and Change

Objectives
Students will:

- Define the term space.
- Create a basic map of the school campus, including labels, orientation (compass rose or North arrow), legend, and scale.

Materials

- Large paper for creating maps
- Pencils (standard and color) and drawing tools
- Rulers and/or tape measures
- Computers with Internet access (optional)
- Printed maps and satellite images/aerial photographs of the school campus

Time Needed
One to two 50-minute periods

Technology Options
Google Maps

Background

A quick search on the Internet or in a dictionary reveals that space is frequently defined as an area void of objects, an expanse, an interval of time, or simply a distance between two objects. The National Geography Standards (NCGE 1994, 2012), however, define space in the following way:

> *"...space in the world is identified in terms of location, distance, direction, pattern, shape and arrangement."*

In *Step 1: Understand Space*, students develop their own definitions of space as it relates to geography by creating a basic map of their school campus. Students explore the campus, using existing maps and aerial images as reference, and considering the components of geographic space (location, distance, direction, pattern, shape, and arrangement). This information is used to draw line maps documenting the major campus features.

Through this process, students develop enhanced mapping skills and understand the meaning of *space* as they experience, measure, and document the locations, distances, directions, patterns, shapes, and arrangements of the school campus.

Process

1. Work with students to create a class definition of the components of *space* according to *geographers* - location, distance, direction, pattern, shape, and arrangement. Place the definition somewhere visible in the classroom.
   For example:

   Space is:

   Where things are located (latitude and longitude),
   How far apart or close together they are (miles, feet, meters),
   Where they are compared to other things (north, south, east, west), and
   How they are arranged or distributed (including patterns and shapes).

2. Discuss with students that they will individually create and label maps that communicate the *space* of the school grounds.
3. Guide students as they orient themselves to the school campus by first using paper maps (such as the ones provided to substitute teachers, fire evacuation maps, etc.). Then provide students with digital images (satellite or aerial images from Google Maps, Google Earth, etc.).
4. As students look at these resources, briefly discuss student observations of the school campus structures and features.
5. Upon completion of the discussion, provide students with rulers/tape measures, note paper and pencils to utilize as they physically walk around the outside the school. During this time, students can create scratch maps while taking measurements, writing notes, etc.
6. Once back in the classroom, students then create their own campus maps that depict the space of the school campus: Locations, distances, directions, patterns, shape and arrangement (including buildings, etc.). Labels, orientation (such as a compass rose or North arrow), scale and legends should be discussed and included as desired (See Figure 1). Note: If needed, students can use existing maps and images to assist with the creation of their maps. Students should also have the opportunity to return to areas of the campus for further measurements, notes, etc.

7. Upon completion of the maps, facilitate students as they share and discuss in terms of spatial features:

   What structures or features are on the campus? Where are the structures? [location]

   Are the features/structures grouped or located in particular locations? [arrangement, pattern, shape, direction]

   Do you see any patterns related to how the features or structures are arranged or grouped? [arrangement, pattern, shape, direction]

   What do you notice about the distances between different features or structures or groups of features or structures? [distance]

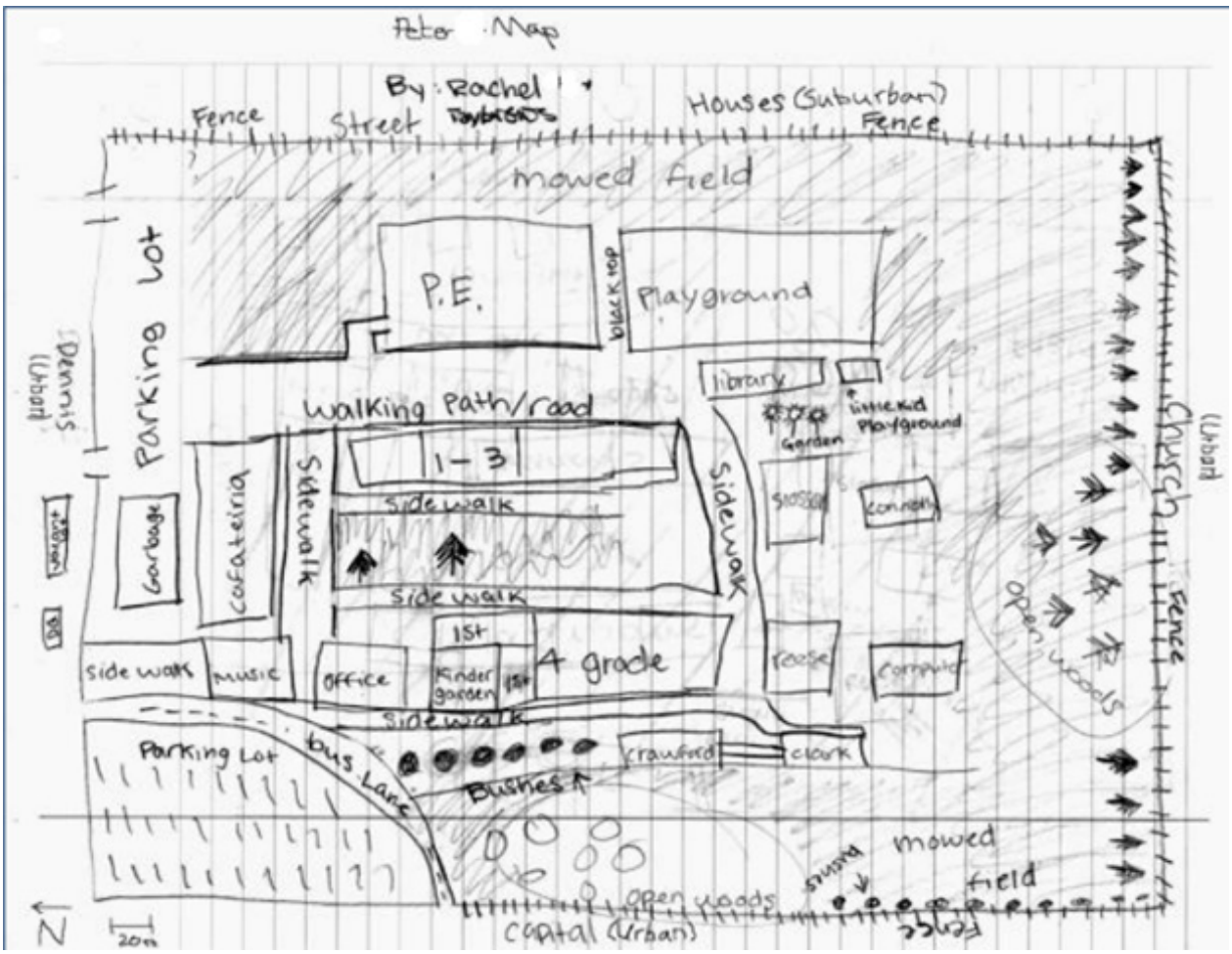


Figure 1. Student Campus Map (6th Grade Student, Peter G. Schmidt Elementary)

Step 2: Define Place

Learning Level
Novice Learner

NGSS Standards
3-5-ETS1-1 Engineering Design
5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

NCSSS Standards
Theme 2: Time, Continuity, and Change
Theme 3: People, Places, and Environments

Objectives
Students will:

- Define the term place.
- Determine the physical/natural and human/cultural components of a place - the school campus.
- Determine the relationships between the physical/natural and human/cultural components on the school campus.

Materials

- Large student-created maps (Step 1)
- Pencils (standard and color), rulers, and drawing tools
- Computers with Internet access (optional)
- Materials about the school campus: Printed maps, satellite images/aerial photographs, photos, pamphlets, brochures, or websites, and other materials from local museums or experts. (For more information related to types and access, see Table 4).

Time Needed
One to two 50-minute periods

Technology Options
Google Maps

Background

A school campus is more than just buildings and features. It is a collection of human and physical components that are continually interacting. In fact, a school campus is a place.

According to the National Geography Standards (NCGE 1994, 2012), "Place is identified in terms of the relationships between physical environmental characteristics, such as climate, topography, and vegetation, and such human characteristics as economic activity, settlement, and land use... Place, in fact, is space endowed with physical and human meaning" (NCGE, p. 31-32).

In *Step 2: Define Place*, students explore the physical/natural and human/cultural characteristics of their school campus. They read and interpret various sources including maps and aerial photographs, adding to their personal maps and enhancing their geographic skills. During this process, the students consider the relationships between the human and physical features on the campus and the impacts of those relationships. The students discover what makes the school campus a place.

Process

1. Revisit the definition of space created during Step 1, discussing how looking at the spatial features of a location can help someone develop a very general understanding of that location. However, to really understand what a site is like (such as the school campus), one must look at it as a place.

2. Share the National Geography Standards definition of place (NCGE 1994, 2012):

"Place is identified in terms of the relationships between physical environmental characteristics, such as climate, topography, and vegetation, and, such human characteristics as economic activity, settlement, and land use... Place, in fact, is space endowed with physical and human meaning" (NCGE, p. 31-32).

3. Discuss the fact that defining place requires students to have an understanding of physical/natural and human/cultural characteristics of a space. Work with students to define physical/natural characteristics and human/cultural characteristics, and give examples of these types of characteristics (Table 3).

   If you were asked to describe the physical or natural characteristics of a place, what features of that place would you need to describe?

   What would you need to describe if you were asked about the human or cultural characteristics of a place?

Table 3. Physical and Human Characteristics of a Place

Physical and Human Characteristics of a Place	
Examples of Physical (Natural) Characteristics	Examples of Human (Cultural) Characteristics
Landforms Soil types Water features Economy Biomes Climate Natural vegetation Topography	Communities Land use Economy Religion Built components Political systems Settlement

4. Revisit the maps created of the school grounds during Step 1. Explain that the students will now add features and labels to their maps that further communicate the current physical and human characteristics of the school grounds, including land use, traffic/movement, types of vegetation/plants, topography, weather, etc.

   Discuss potential resources for finding the necessary information about physical and human characteristics of a place with students. Where might they look? How many sources should they use? How do they know the information is accurate? Share available materials with students (Table 4).

   Note: Sometimes it can be helpful to have students divide up research so that different teams or students can look more in-depth at particular components. However, during this initial activity, all students should be given the opportunity to practice looking at different maps and resources to determine the physical and human characteristics of a place.

5. Students add details, draw arrows, or even create symbols to depict the physical and human characteristics of the school campus to the line map, using resources you provide (maps, images, and additional materials, see Table 4). All details should be labeled, and a legend for all features and symbols should be placed on the map or a supplementary piece of paper.

   Note: The purpose of this activity is to provide students with an opportunity to utilize a variety of resources while gathering and mapping information related to physical and human components. It is not intended to be too in-depth (or to require an extensive amount of time), as the students will later conduct a more thorough study of a less-familiar location.

Table 4. Sources of Information and Maps for Documenting Features of a Place

Sources of Information and Maps for Documenting Features of a Place
Printed maps. (Planimetric maps with line drawings). These maps typically show streets, buildings and some local features. Hard copy county and city maps are usually provided free of charge by local government offices. **Satellite images and/or aerial photographs**. These images can be obtained free of charge from online GIS programs or desktop software such as Google Maps, ArcGIS Explorer Online or Google Earth. In addition, the state departments of natural resources, fish and wildlife agencies, local museums or public libraries may have both historical and current images. Be sure to note the date on the aerial photos. **Pictures and Images of people, places and things.** Pictures and images can come from students' families, local museums, or even the public library. It is helpful if images are labeled with descriptions and dates. **Pamphlets, brochures or websites.** Materials from local governments, organizations or groups can provide additional information related to both physical and cultural characteristics of an area. **Local museums and experts**. Frequently, cities and towns have local historical museums and volunteers eager to share their knowledge. Specific questions and/or requests can ensure that students receive the necessary information and materials. *Note:* In addition to recent resources, historical maps, images, aerial photographs, etc., can be valuable tools for visualizing how areas have evolved – enabling students to have an increased awareness of patterns and movement. (Dates should always be written on maps and photos.)

6. Upon completion of the student maps, have students share the physical and human characteristics documented on their maps through small group and/or large group sharing sessions. Compile a list or master map that depicts the characteristics.

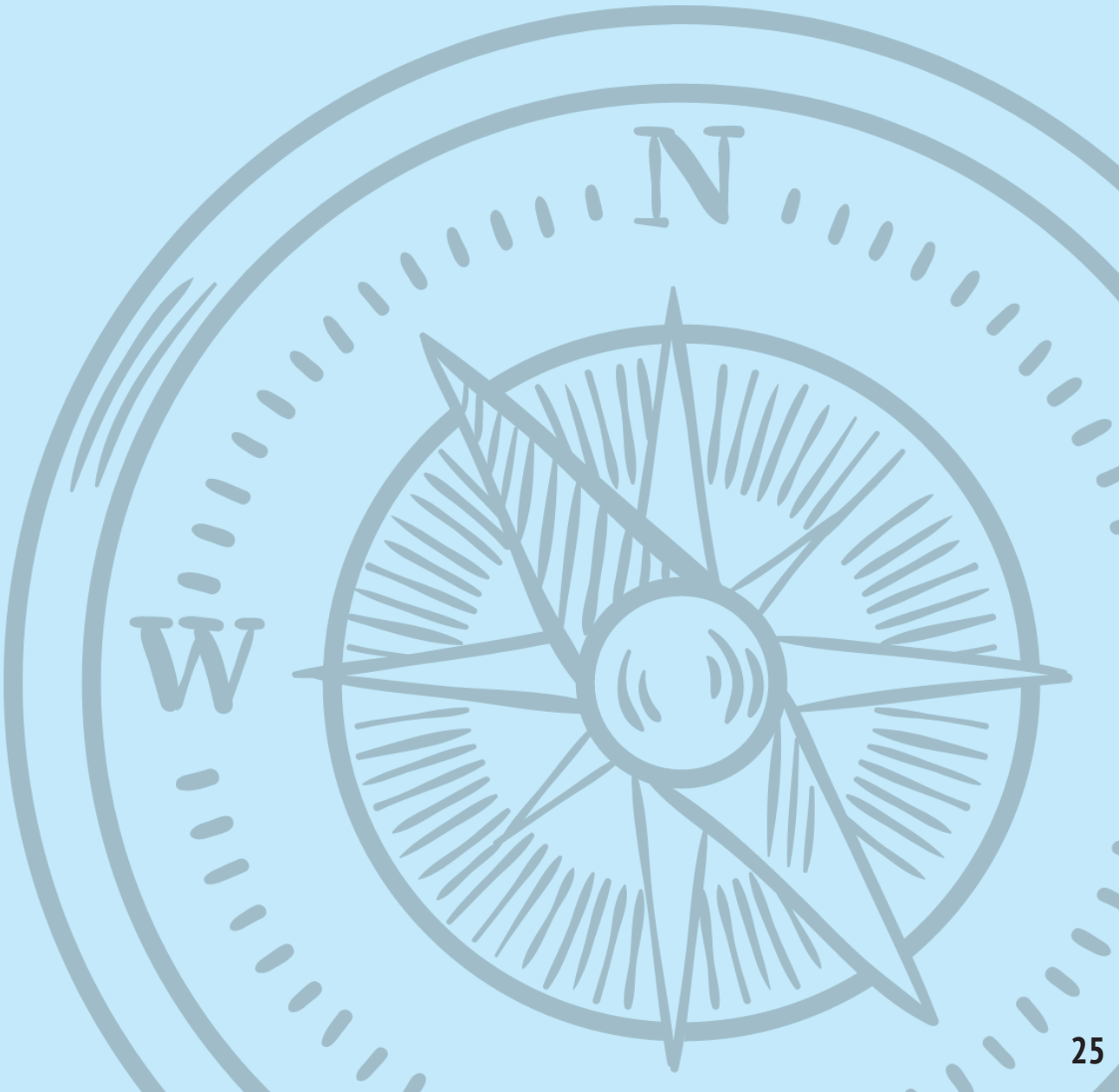
7. Discuss the fact that the physical and human characteristics of a location do not exist in isolation. Frequently, the features of a location interact and influence one another.

8. Brainstorm with the students about how different physical and human characteristics might affect or be affected by other characteristics of a location, such as the school campus. Create diagrams, images and/or lists as desired.

9. Reflection: Ask students to reflect upon their observations by responding to the following prompt:

   Choose one physical or human characteristic of the school campus. Thoroughly describe the characteristic and how it might affect or be affected by other characteristics of the school campus.

   For example, describe the school garden and how it might affect or be affected by student traffic (where kids walk), noise levels, weather, and student learning/activities.



CHAPTER 3:
SPATIAL INQUIRY

Overview

Spatial Inquiry, the first phase of the Landscape Investigation, is a process through which students build upon their understanding of physical/natural and human/cultural components as they begin a study of a less familiar location.

As students begin the process, they first determine a location of focus and create a Field Study Journal to serve as the repository for student documents, data, and resources compiled throughout the Landscape Investigation. The students then gather geographic data related to the physical and human characteristics of the location from maps and artifacts, organize that data, and communicate the results of their research. Through this process, students discover the complexities of Spatial, Ecological, Economical and Historical (SEEH) relationships surrounding the characteristics, patterns, and processes within a location.

For related activities from Project Learning Tree and Project WILD, see Appendix C.

Step 1	Organize Students designate the location to be studied and assemble Field Study Journals to be used throughout the Landscape Investigation.
Step 2	Develop Base Map Students utilize a variety of maps and images to describe and document the location's physical and human characteristics.
Step 3	SEEH the Location Students build upon their knowledge of a location as they consider the trends, patterns and relationships of its physical and human characteristics in relation to the four perspectives of geography: Spatial, Ecological, Economical and Historical (SEEH).
Step 4	Summarize Students communicate an understanding of the physical and human characteristics of a location, as well as the spatial, ecological, economic and historical impacts and interactions (patterns, relationships) of those characteristics

Step 1: Organize

Learning Level
Intermediate Learner

NGSS Standards
MS-ETS1-1 Engineering Design

NCSSS Standards
Theme 2: Time, Continuity, and Change
Theme 3: People, Places, and Environments

Objectives
Students will:

- Designate a location of focus for the Landscape Investigation
- Create Field Study Journals that will contain resources, written materials, and data collection documents during all three phases of the Landscape Investigation.

Materials

- Binders and dividers for the Field Study Journals
- Notebook paper and writing utensils

Time Needed
25 minutes

Technology Options
Google Maps

Background

The documentation of information, whether gathered from maps and research or collected through interviews, is a crucial component of the Landscape Investigation process. During Step 1: Organize students to create Field Study Journals for use throughout the three phases of the Landscape Investigation. The compilation of materials, data, and resources in these Field Study Journals ensures that students have access to the "complete picture" as they gather information, formulate predictions, develop questions, gather data, and compile their findings.

Process

1. First, pre-select or work with the students to select one location (city, town, or other location where physical and human-built environments interact) that they all will investigate both in the classroom and in person. Ideally, the students will have a limited familiarity, if any, with the location.

Note: To ensure an appropriate location, prior research by the teacher is strongly recommended. An appropriate site and manageable boundaries can be determined by visiting a site or sites in advance of classroom discussions. In addition, verification of accessibility (both by bus and by foot) is important. Other considerations include hours of operation for businesses and scheduled construction activities (for roads and/or buildings).

However, do not notify the businesses and residents that students will be conducting a study of the area, including interviews. This ensures the authenticity of the investigation process.

2. Discuss the Landscape Investigation process with the students. Explain the three phases of the Landscape Investigation (Spatial Inquiry, Connective Inquiry, and Analytical Inquiry) and how the students will utilize some or all of these processes as they develop the skills to not only understand spatial patterns and relationships, but also to identify and predict the impacts of human activities on the landscape.

3. Once students have a general understanding of the Landscape Investigation process, introduce the Field Study Journal. This journal will be used as a repository for maps, written materials, and data collection documents developed and utilized during all three phases of the Landscape Investigation.

4. Provide the students with the journal materials (binder, dividers, etc.) or have the students bring them from home.

5. Guide the students as they assemble their journals. For a suggested list of journal sections, see Table 5.

6. Upon completion of the journals, discuss the journal policies and procedures, such as document headings, where the journals should be stored and if the students can remove the journals from the classroom (take them home).

Table 5. Sections for Field Study Journals

Journal Heading	**Landscape Investigation Phase**	**Materials to be placed in this section**
Location Maps and Artifacts	Spatial Inquiry, Connective Inquiry, and Analytical Inquiry	Maps, materials and artifacts collected before and during the field study Pocket for storing artifacts collected during research and/or the field study (Note: Student-created maps could be placed here or in a new section.)
SEEH the Location	Spatial Inquiry	SEEH Guiding Questions document SEEH Discussion Questions document SEEH Student Summary writing prompt and written summary
Focus Question and Prediction	Connective Inquiry	Student KWL charts and/or documents Focus Question document Prediction document
Field Study Documents	Connective Inquiry	Field Study Itinerary/Student Roles and Responsibilities Interviewing Guide Observations document Blank notes pages Pocket for storing thank you notes (or place at back of binder)
Information and Data Analysis	Connective Inquiry	Debrief Reflection document Charts, graphs and analysis materials
Communication of Findings	Connective and Analytical Inquiry	Presentation documents and materials
GIS Information and Analysis	Analytical Inquiry	Computer-generated maps, charts, graphs, and analysis materials

Step 2: Develop Base Map

Learning Level
Intermediate Learner

NGSS Standards
MS-ETS1-1 Engineering Design
MS-LS2-3 Ecosystems: Interactions, Energy, and Dynamics

NCSSS Standards
Theme 2: Time, Continuity, and Change
Theme 3: People, Places, and Environments

Objectives
Students will:

- Utilize maps, charts, and additional supplementary materials to describe a location's physical/natural and human/cultural components.

Materials

- Laminated basic line map of the location to be researched
- Wet-erase markers such as Vis-a-Vis. (Using erasable markers on a laminated map allows for students to alter markings/notes as needed and for the maps to be cleared and used repeatedly)
- Printed or digital large scale map of the location
- Printed or digital small scale ("zoomed in") map of the location
- If needed: Satellite images/aerial photographs, photos, pamphlets brochures or websites, and other materials from local museums or experts (see Table 4)

Time Needed
One 50-minute period

Technology Options
Google Maps

Background

During Step 2: Develop Base Map, students explore the human and physical characteristics of the location of focus. They work as teams to read and interpret various sources, including maps and aerial photographs, adding to their basic line maps and enhancing their geographic understanding of the location's physical and human components.

Process

1. Provide a general introduction to the city, town or location (to be called the location from this point forward) to be researched – communicating its position in relation to the rest of the state, watershed, etc. and other basic information such as population.
2. Divide students into teams of three or four, and have student teams find the location on a large scale map (a paper or digital state map or county map).
3. Work with students as they consider the boundaries and adjacent areas of the location, as well as the physical and human features visible on the map
    - Where is the location in relation to topographic features (such as the mountains or a river)?
    - How far away is the closest town or community?
    - Can you distinguish the boundaries of the location? Is it part of a bigger area?
4. Provide each student or student team with a laminated basic line map of the location (not a satellite image or topographic map), as well as a small scale, "zoomed in" map of the location (paper or digital).
5. Have student teams note any physical or human characteristics that are apparent within the boundaries of the location; drawing, circling or otherwise marking them on their laminated maps with wet-erase markers. The students may begin to create legends/keys at this point, if needed.
6. If needed, provide students with additional materials (see Table 4) to research additional physical and human characteristics of the location.
7. Discuss the students' observations and maps, allowing students to add to or modify their maps as needed.

Step 3: SEEH the Location

Learning Level
Intermediate Learner

NGSS Standards
MS-ETS1-1 Engineering Design
MS-LS2-3 Ecosystems: Interactions, Energy, and Dynamics

NCSSS Standards
Theme 2: Time, Continuity, and Change
Theme 3: People, Places, and Environments

Objectives
Students will:

- Utilize maps, charts and additional supplementary materials to describe the relationships between a location's physical and human components through the four geographic perspectives: Spatial, Ecological, Economical and Historical (SEEH).
- Determine and communicate findings related to trends, patterns and/or relationships between the physical and human characteristics, as well as the SEEH components, of a place.

Materials

- Laminated basic line map of the location to be researched
- Wet-erase markers such as Vis-a-Vis. (Using erasable markers on a laminated map allows for students to alter markings/notes as needed and for the maps to be cleared and used repeatedly)
- Printed maps, satellite images/aerial photographs, photos, pamphlets brochures or websites, and other materials from local museums or experts. (Current and historical, see Table 4)

Time Needed
Two 50-minute periods

Technology Options
Google Maps

Background

Once students recognize the physical and human characteristics of a location, they can begin to observe the trends, patterns, and relationships between those characteristics. During Step 3: SEEH the Location, students are introduced to the four perspectives of geography: Spatial, Ecological, Economical and Historical (SEEH). Utilizing these perspectives, students are able to consider how physical and human characteristics interact and impact one another and, as a result, the location.

Process

1. Introduce the four geographic perspectives: Spatial, Ecological, Economic, and Historical (SEEH) as a way to understand the relationships between the physical/natural and human/cultural elements that make a location a place.

2. Students then work collaboratively, utilizing the SEEH the Location: Guiding Questions document (Table 6), as they gather information about the characteristics (physical and human) and relationships within the location – including trends and patterns. Students should use a minimum of three maps, images, and additional resources (see Table 4 for a list of additional resources).

Note: To enhance student understanding of the Historical Perspective, students can look at historical satellite images/aerial photographs and compare them with current images. See activity: Then and Now from Project WILD's Science and Civics guide, page 41.

3. Students will respond to the Guiding Questions by adding details, drawing arrows, or even creating symbols to depict characteristics and features, as well as the relationships between those characteristics and features on their line maps. All details should be labeled, and a legend for all features and symbols should be placed on the map or a supplementary piece of paper. Additional facts and information that students deem significant can be written on notebook paper.
4. After student research is complete, facilitate a discussion concerning what students have learned about the location through mapping it (see Table 7). Allow students to refer to their maps and notes as they describe their

Table 6. SEEH Guiding Questions

SEEH the Location: Guiding Questions	
Spatial Perspective: • Where are the structural features (buildings, playgrounds, other structures)? • Where are the roads, driveways, or parking lots? • Where are the areas occupied and not occupied by people? • What patterns do you see concerning the use of the space (such as traffic patterns, locations of buildings/ structures, etc.)? • How might the locations of different features or structures impact one another and/or the site (including traffic – foot and vehicle, construction and building placement, noise levels, building temperatures, etc.)?	Economic Perspective: • What are the types and numbers of structures and features in the location (permanent buildings, temporary or long-term buildings, parking lots, roads, sidewalks, etc.)? • Does the location have athletic courts/fields/ stadiums? If so, how many and what is their condition? • Are there any maintained natural areas such as gardens, grass fields, etc.? • How many cars are within the location? Mopeds/ motorbikes? Bicycles? • Does the location have restaurants, stores, gas stations, etc? • How might the economics within the area impact the features/characteristics of that location (including types, numbers, conditions and sizes of buildings, natural areas, roads, etc.)?
Ecological Perspective: • Are there any natural areas? If so, ◊ Where are they? ◊ What type of area(s)? Forests, gardens, grass fields, etc. • Are there any areas where wildlife can easily move from one place to another? • Are there natural areas that people can access? • What patterns do you see concerning the use of the spaces (such as locations of open/green spaces, the placement of trees and gardens, etc.)? • How might the locations of different natural areas impact one another and/or the site (including types of wildlife in the area, play areas for children, building temperatures, people movement, etc.)?	Historical Perspective: • How has the location changed over time? (Spatially, Ecologically, or even Economically) • How have the people (residents, tourists, business owners, employees, etc.) changed over time? • What patterns do you observe (similar structures and/or features being placed in the same area year after year, building additions impacting parking lots and/or traffic patterns, etc.) • What may have influenced changes in the location and/or the people visiting, living, or working in the location? (Keep in mind the S.E.E.H. perspectives.)

Table 7. Spatial Inquiry Research Discussion Questions

Spatial Inquiry Research Discussion Questions

How have we as humans shaped this place over time?

What patterns are apparent from your observations and maps?

- In relation to the physical/natural and human/cultural features - such as land use, water movement, locations and/or concentrations of activities/features, traffic, etc. - that have happened/changed over time.
- In relation to the spatial, ecological, economic, and historical perspectives.

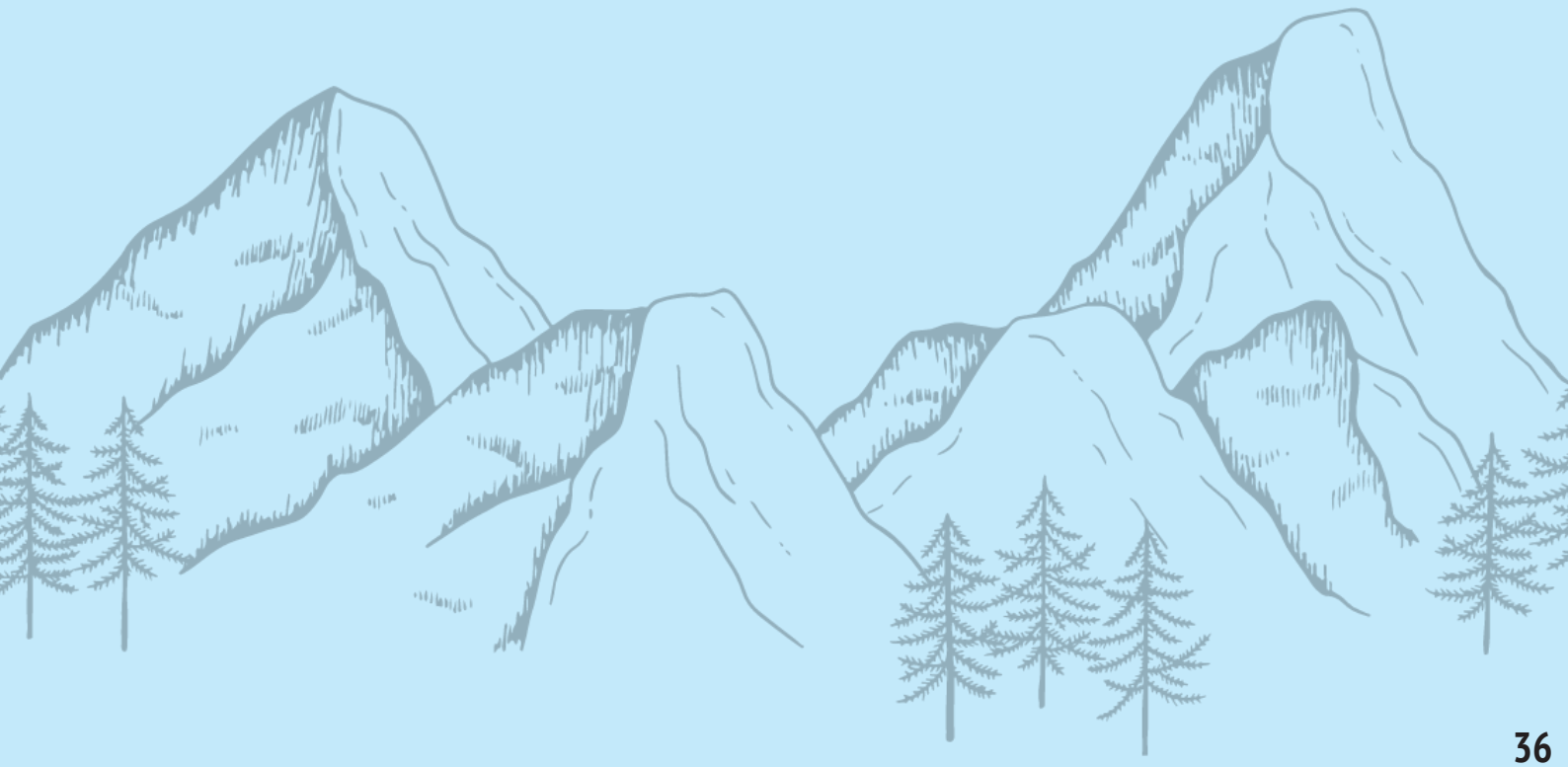
What may have influenced the patterns? In other words, Why are things where they are (or the way they are)?

What impact has human activity had on _____ (placement of businesses, roads and traffic patterns, parks/green spaces or other structures; the size, location and/or distribution of natural features such as forests, fields, creeks or rivers, etc.)

What impact have natural and/or built features had on human activities (including building or road placement, movement, use of community features, etc.)?

How might different features/characteristics of this place interact?

How might the patterns and interactions of this location impact _____? (where people choose to live, what businesses are successful, where wildlife live and find food, clean water sources for people and animals, etc.)



Step 4: Summarize

Learning Level
Intermediate Learner

NGSS Standards
MS-ETS1-1 Engineering Design
MS-LS2-3 Ecosystems: Interactions, Energy, and Dynamics

NCSSS Standards
Theme 2: Time, Continuity, and Change
Theme 3: People, Places, and Environments

Objectives
Students will:

- Communicate the spatial, ecological, economic and historical impacts and interactions (patterns, relationships) of the physical and human characteristics of a location.

Materials

- Student-generated map of the location
- Field Study Journals
- Notebook paper and writing utensils

Time Needed
One 50-minute period

Technology Options
Google Maps

Background

Through a written summary, students communicate an understanding of the physical and human characteristics of a location, as well as the spatial, ecological, economic, and historical impacts and interactions (patterns, relationships) of those characteristics. Student summaries are then shared through small or whole group sessions, exposing students to a variety of in-depth discussions concerning various features and patterns of the location.

Process

1. Following the facilitated discussion (Step 3), students work independently to write a summary, choosing one feature or pattern of the location to describe in detail, including the SEEH perspectives and discussion questions in relation to the physical and human features (see Table 8).

These summaries will provide valuable insight as the students move from using maps and resources to develop a general understanding of a location to conducting their field study.

2. Once students have completed their summaries, provide an opportunity for a whole-class or small group sharing session of the summaries so that students are exposed to a variety of in-depth discussions concerning various features and patterns of the location. Summaries and maps should be placed in the student journals.

Table 8. Spatial Inquiry Research Summary Prompt

Student Summary Writing Prompt:

Choose one feature or pattern you have observed using the classroom maps and resources of the location. In at least two paragraphs, describe that feature or pattern, making sure to answer the following questions:

- What is the feature/pattern? (Describe in detail. Do not just say "the road" or "buildings".)
- Where is the feature/pattern located? (It covers an entire community, is on the West side of a town, runs along the highway, etc.)
- Keeping both human activities and physical processes in mind, how has this feature/pattern affected (influenced or changed) the location and/or been affected by the location:
  - ◊ Spatially (where things are located, traffic patterns, where green spaces and parks are located, where human activities take place, etc.)
  - ◊ Ecologically (water runoff, air pollution, green spaces, water quality, etc.)
  - ◊ Economically (new construction, business locations, events such as festivals or fairs, empty stores, etc.)
  - ◊ Historically (What has changed in relation to the feature/pattern and the community over time?)

CHAPTER 4:
CONNECTIVE INQUIRY

Overview

Upon completion of the Spatial Inquiry phase of the Landscape Investigation, students are familiarized with the complexities of Spatial, Ecological, Economical and Historical (SEEH) relationships surrounding the characteristics, patterns, and processes within a location.

During the Connective Inquiry phase of the Landscape Investigation, students delve deeper as they move beyond maps to research a location - formulating questions and making predictions about community perceptions related to a specific issue or event. Students then prepare for and participate in a field study, through which they experience the location first-hand while collecting qualitative data through observations and interviews.

Students then use the data to consider the connections, patterns, and trends related to the spatial, economic, ecological, and historical perspectives. They summarize their findings and reflect on how human activities can impact the landscape. For a case study of the Connective Inquiry process, see Appendix B.

For related activities from Project Learning Tree and Project WILD, see Appendix C.

Landscape Investigation: Connective Inquiry Process

Step 1	**Develop a Focus Question** Students utilize a variety of resources as they consider the human connections to the changes, trends, and issues of a location. Through research and facilitated discussions, students determine an issue or event of interest and formulate a focus question to guide the Connective Inquiry phase of the Landscape Investigation.
Step 2	**Research Design** Students structure their field study as they develop an Interviewing Guide for use while interacting with different individuals within the location. The students then write about what they hope to learn. They also gain an understanding of ethics in human subjects research.
Step 3	**Prepare** Students receive training and develop field study documents while establishing the skills to make intentional observations, conduct open-ended interviews and collect artifacts through the lens of the focus question.
Step 4	**The Field Study** Students are immersed in an in-depth exploration of a location while actively observing, interviewing, and collecting artifacts related to the Focus Question. Through this process, the students experience first-hand the relationships between the physical and human features of the location while also examining first- hand the spatial, economic, ecological, and historical perspectives of that place.
Step 5	**Evaluate, Organize and Communicate** Students play the role of social and/or environmental geographers as they compile the information and data from their Field Study and evaluate the patterns and relationships related to their focus question. Students create a visual and/or written summary about their location and share their conclusions through presentations to their peers and community members.

Step 1: Developing a Focus Question

Learning Level
Advanced Learner

NGSS Standards
HS-ETS1-1 Engineering Design

NCSSS Standards
Theme 2: Time, Continuity, and Change
Theme 3: People, Places, and Environments
Theme 5: Individuals, Groups, and Institutions

Objectives
Students will:

- Utilize a variety of resources to research a location's issues and/or events as they relate to the human and natural systems, as well as the SEEH perspectives.
- Develop focus question to guide the field study.

Materials

- Field Study Journals
- Internet, newspapers/ newspaper articles, historical images/photos, and other resources that contain information about issues or events within the community of study.
- Notebook paper and writing utensils

Time Needed
One to two 50-minute periods

Technology Options
Google Maps

Background

During Step 1: Develop a Focus Question, students research the changes, trends, and issues of a location. They move beyond maps to consider the human connections through news articles, photos, and even video clips. Critical thinking and questioning skills are developed as students conduct deeper research that looks at the relationships between human and physical systems, as well as the Spatial, Ecological, Economic and Historical perspectives related to specific issues and events within the location.

Then, through a facilitated discussion, students determine the issue or event of interest and create a focus question to guide their Connective Inquiry field study.

Process

1. Discuss with the students that through the Spatial Inquiry phase, they learned a wide variety of information about the location itself. Tell the students that they will now be looking more into the human connections within that location while they determine the focus (or overall) question that will guide them as they further examine the spatial characteristics, patterns, and relationships within a location in relation to a specific change, issue, situation, or event taking place in that location.
2. Create a large KWL Chart or separate posters with the titles: What We Know, What We Want to Know, and What We Learned.
3. Ask the students to first share any changes, events, issues, or situations that they may know about related to the location – either from looking at maps or other resources during their Spatial Inquiry process or from what they have seen, read, or heard from the news, family or friends. Post student responses under the section or poster titled *What We Know*.
    Examples: Dam removal, construction of a particular store or facility, closing of a particular store or industry, wildlife sightings (or lack of), restoration of a wetland or forested area, traffic issues on a major road, etc.
4. Then discuss with the students what they want to learn more about concerning those changes, events, issues, or situations. Students can create statements or questions about specific events/issues or general observations. For example: *Why are the community members arguing about the possible construction of _____?* or *We notice there is less green space than there used to be. Has the amount of wildlife changed?* Post the statements and questions under the section or poster titled *What We Want to Know*.
5. Provide students with time to research and find information related to their questions and statements, either individually or as teams. These findings should be recorded in the students' Field Study Journals (with the heading: *What I Have Learned*).
6. Once research is complete, work with the students to create a class list under the section or poster titled *What We Have Learned,* grouping similar facts and information as students list them, if possible.
    Optional: Students can first work in their teams, determining their top 3 to 5 facts or information and write each fact/statement on a separate large strip of paper (such as sentence strips or pieces of legal paper cut into long strips, approximately 4 inches high). Then, the facts can be sorted and organized on the poster as students work to determine the focus question (see next step).
7. Guide the students as they look through the class list (of what they have learned) as they determine any issues or situations that stand out as topics they could further research through a field study.
8. Continue to narrow down the choices until the class determines one change, event, issue or situation that will be the field study focus.
9. Then, using the information from their research, work with the students to create a focus question. For example focus questions, see Table 9.
10. Have the students write the focus question in their Field Study Journals and post it in a prominent location of the classroom. A bulletin board or empty wall space below the question can be a repository for maps, resources and student comments and/or questions as they research their focus question.

Table 9. Connective Inquiry Example Focus Questions

Example Questions:
How has the decrease in green spaces affected the types of wildlife living in the location?
How will the construction of the NoName Facility affect the location?*
How has the development of the NoName Neighborhood (or Facility) impacted the location?* How is the location changing through the eyes of a(n) (animal)?
How is/has changing/changed (in) the location over time? (Habitat access for wildlife, wildlife movement, stormwater run-off, litter, air pollution, microclimates, traffic, tourism, etc.)**

*Spatially, ecologically, and/or economically
**If desired, terms such as habitat, movement, stormwater runoff, and microclimate should be defined during the Spatial Inquiry phase of the Landscape Investigation.

Step 2: Research Design

Learning Level
Advanced Learner

NGSS Standards
HS-ETS1-1 Engineering Design

NCSSS Standards
Theme 2: Time, Continuity, and Change
Theme 3: People, Places, and Environments
Theme 5: Individuals, Groups, and Institutions

Objectives
Students will:

- Design an Interviewing Guide to be utilized during the interview process of the Field Study.
- Develop a prediction as to the overall or general response to the Focus Question.

Materials

- Field Study Journals
- Notebook paper
- Pencils

Time Needed
One 50-minute period

Technology Options
Google Maps

Background

Once students develop a Focus Question, they must consider how they are going to find the answer. During *Step 2: Research Design*, students learn about the role of interviewing individuals within a location. They develop an Interviewing Guide that consists of reminders and relevant questions to help the students as they interview individuals. This guide provides enough direction to ensure that students collect the pertinent information, but also allows for extended conversations and additional questions as they arise.

As students formulate questions, they may find themselves anticipating how those questions might be answered. Providing students with an intentional opportunity to record those ideas can raise student awareness of potential bias and can empower students to focus on interviewee responses during the Field Study. Support students' natural desire to predict, but also encourage them to be open to responses they did not expect.

Process

1. Review the Focus Question and ask: What type(s) of information do we need to answer this question?
2. Write student responses on the board.
3. Discuss where students can get the information and data needed to answer the question: Books, the Internet, field investigations, experts, etc.
4. Explain that while books and the Internet can provide information and insight about the Focus Question, the best way to get an in-depth understanding on the human and physical connections to the issue or situation of interest is to actually go to the location making observations and collecting data.
5. Ethics in Research - Use this time to explain to students the importance of ethics in human subjects research. They will need to submit their interview plan to you, the teacher, and create informed consent scripts to use with those they are interviewing. (See Appendix E for more). Before entering any research plan dealing with human subjects, it is important to know that people must be allowed to refuse to participate, that their comments will remain confidential, and that no identifying images of them will be used without their explicit consent.
6. Discuss the role of interviewing individuals while visiting the location.
    - Do maps, charts, articles and news shows show us everything we need to know about the history, development and interactions in an area? (No.)
    - Can we determine the answer to our Focus Question by just looking around an area? (No)
    - How can we learn more? (By talking to people who live there.)
    - What can we learn from interviewing people who visit, live and/or work in a place?
    - How many different people should we interview? Why?
    - Will everyone answer the same interview questions in the same way or will we discover multiple perspectives/points of view related to our focus question? Why?
7. Once students understand the role of interviewing, discuss questioning strategies and work with the students to develop an Interviewing Guide that they will use as they interview individuals during their Field Study.

The Interviewing Guide should consist of reminders and relevant questions to help the students as they interview individuals. It should provide enough guidance to ensure that students collect the pertinent information as well as allow for extended conversations and additional questions as they arise.

It should not be a list of questions with blank spaces that students will simply fill out with one- or two-word responses from individuals, but rather a series of optional question starters, questions, or thoughts to assist students as they interact with the individuals they are interviewing. The goal is to involve students in conversations, not just brief question-answer interactions.

Guide Development

A. First brainstorm with students to determine the basic information they should gather about individuals they interview:

- Oral consent to participate in the project
- Name (make sure to get the correct spelling)
- Role within the location (business owner, resident, visitor)
- Specific information related to the person's role:
  - Business owner – type of business, length of time in business, etc.
  - Resident – length of time living in the place
  - Visitor – number of visits to the place, reason for visit

B. Then ask students What information do you need in relation to your Focus Question? (Revisit the responses on the board, adding to or revising them as needed.) Use the student responses to help them create open-ended and relevant questions or question starters. The list generated can become a Question Bank within the Interviewing Guide document.

Encourage students to keep the Focus Question and the SEEH (spatial, economic, ecological and historical) perspectives in mind as they ask questions. Be sure they word their questions to go beyond the one word or brief statement responses.

- Why did/have you...?
- What types of_____have you observed?
- What have you seen/noticed concerning_____?
- Has_____changed? Why do you think that is?
- What happens when_____?

C. Ask students how they would respond if the interviewee was not clear or gave too brief an answer. Help students create a list of follow-up questions/statements.

- Verification: How do you know that is so?
- Clarification: What do you mean by...? or What I am hearing you say is...
- Elaboration: Please say more about that.
- Variety: Are there other ideas (reasons, causes, interpretations)?

8. Review student questions, making recommendations for revisions as needed, as students create their Interviewing Guides.

9. As students have been formulating questions and developing their Interviewing Guides, they probably are already anticipating how those questions might be answered by the individuals found within the location. Discuss with students how researchers use early ideas to shape their projects, but that they do not allow these early ideas to shape their research, rather they are useful for uncovering bias and for being sure to openly listen to research participants.

10. Revisit the Focus Question. Walk the students through the process of writing a prediction of the overall response to the Focus Question. In other words, they are not predicting the individual responses to the Focus Question or to each specific question on the Interviewing Guide. They are anticipating what the general or overall response from most individuals will be in relation to the Focus Question. (See Appendix E: Student Example)

11. Explain to students that their predictions do not have to be "right" and that they need to be aware of their personal opinions so that they do not attempt to prove their predictions, potentially skewing data and allowing bias to affect their study. Instead, students should make every attempt to simply capture and record the information and opinions of the individuals they are interviewing.

    In addition, students should be aware of their potential bias/opinions so that they ask non-leading questions and actually listen to responses, rather than assuming responses from particular individuals.

12. Have each student place the prediction statement for the Connective Inquiry phase of the Landscape Investigation in the Field Study Journal.

Step 3: Prepare

Learning Level
Advanced Learner

NGSS Standards
HS-ETS1-1 Engineering Design

NCSSS Standards
Theme 2: Time, Continuity, and Change
Theme 3: People, Places, and Environments
Theme 5: Individuals, Groups, and Institutions

Objectives
Students will:

- Discuss personal safety, behavior and responsibilities for the field experience.
- Understand the role of artifacts in a Landscape Investigation.
- Create Field Study documents for making observations and collecting information/data.

Materials

- Field Study Journals
- Notebook paper
- Pencils
- Examples of artifacts

Time Needed
One 50-minute period

Technology Options
Google Maps

Background

The quality of a field study and the information collected during the experience is directly related to the quality of the pre-trip preparations. Most students do not have the foundation to make intentional observations, conduct open-ended interviews or collect artifacts through the lens of a focus question. Additionally, their familiarity with visits to locations away from the school campus is that of a field trip. While field trips play important roles in student interest and education, a Landscape Investigation Field Study is not a field trip. It is an intentional research excursion in which students are immersed in the place they are studying.

As a result, the training prior to the field study must empower students to:

- Maintain an awareness of safety, behavior, and responsibilities during the field experience.
- Observe and document the physical and human features of a place through the four geographic perspectives (SEEH).
- Use effective interviewing strategies.
- Understand the role of artifacts and how to collect them.
- Show respect and appreciation of community members and their input.

Process

Field Study Journals

All documents discussed and created during this step should be placed in the Field Study Documents section of the students' Field Study Journals. (See Table 5)

Activity 1: Student Safety, Behavior, and Responsibilities during the Field Study

Discuss safety, behavior, and responsibilities both during pre-trip preparations and on the morning of the field study.

1. Tell the students that they will be visiting the location they have been researching with their teams. Each team will be assigned a chaperone.
2. Discuss itinerary for the day of the field study (mention Field Study Itinerary).
3. Highlight the fact that safety is the number one concern any time students conduct a field study off campus. Discuss emergency procedures and contacts for the day of the field study. (See Emergency Contacts and Procedures, Appendix G.)
4. Discuss the roles and responsibilities of the chaperones. (See the Your Role as a Chaperone, Appendix G)
5. Clearly go over the Student Roles and Responsibilities (Table 10) with the students, encouraging them to add to or revise it as needed.
6. Also discuss how students will approach community members. If desired, role-play how students will physically and verbally address people in businesses and on the street. Working with the students to create a brief introductory paragraph about themselves and their project can be helpful both for the students as they approach individuals and for the community members themselves. This information can be added to the Interviewing Guide if desired.

Table 10. Student Roles and Responsibilities

- You are in charge of your investigation.
- Chaperones will accompany you for safety purposes, but the chaperones will not participate in the inquiry.
- You must use your mapping skills to investigate the defined place; it is up to you to find your way around the study area. Use a map to determine where you are going.
- Experience the place you are researching by not standing out – immerse yourself in your surroundings.
- Obey all pedestrian and traffic laws.
- Collect artifacts responsibly and appropriately and never take pictures of individuals.
- Conduct interviews respectfully.
- At the end of your field experience, return to the designated location at the assigned time.

Activity 2: Making Intentional Observations

1. Revisit the student-generated location maps, description summaries and the Focus Question. Have the students consider:

    - Were there any questions that came up during your initial description of this location that couldn't be answered by looking on a map or chart?
    - Were there any inconsistencies between two or more maps?
    - What SEEH (spatial, economic, ecological or historical) perspectives or physical/natural or human/cultural features were difficult to determine or describe?

2. Discuss with students that they will be making intentional observations related to their focus question on the day of their field study. Guide them as they create a document that includes the following:

    - Considering their focus question and the information they struggled with during the Spatial Inquiry phase, what should be intentionally observed while in the field?

    Be sure students include tangible objects such as interpretive and/or store signs and historical markers, as well as observations related to the relationships between physical and human features and/or the SEEH perspectives.

    - What additional information is needed to better answer the focus question?

Note: Do not limit student observations by having students create a simple checklist. Instead, the document should consist of a series of questions and guiding statements that students can refer to as they write their observations on separate paper.

The document should also encourage students to collect additional information in their notes they may not anticipate, but deem important while in the field.

3. Review student documents upon completion, making recommendations for revisions as needed.

4. Then discuss the procedures for making observations (for example, observations should be made before or after interviews - not during. Students can choose a location and stay at that location for 5 minutes while making detailed observations, etc.).

Activity 3: Interviewing Strategies

1. Wear a nametag that clearly states your name and the school name.

2. Approach potential interviewees in a friendly and calm manner.

3. Introduce yourselves and explain the study.

4. Teams will interview a minimum of 5 individuals.

5. Every interview situation is different. Be prepared to ask different questions (or sometimes the same questions differently) of each interviewee, depending upon that individual's knowledge base and current role within a location.

   Use the language from the informed consent forms to assure interviewees that all information will remain confidential and they do not have to answer any questions they chose not to.

6. Respectfully show interest in the interviewee and his/her responses.

7. Record interviewees' answers in your notes in as much detail as possible without interrupting the speaker.

8. Thank the interviewee and present him or her with a thank you note. (Created during Activity 5).

Extension: Students can conduct mock interviews with each other and/or with volunteers (school staff, parents, etc.) for practice.

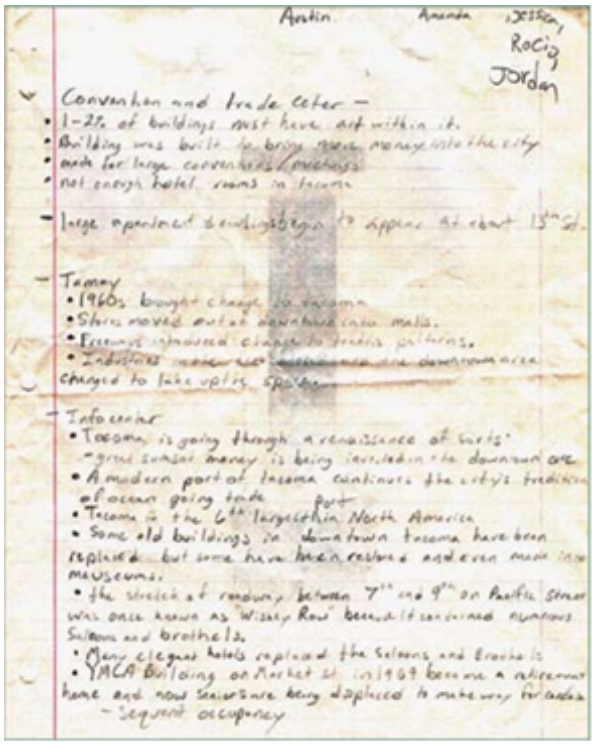


Figure 2. Student Team Field Observations

Activity 4: Understanding the Role of Artifacts and How to Collect Them

1. Define artifact with the students and discuss the types of artifacts they may want to collect to inform their research:

    - In the case of a Landscape Investigation, an artifact is a tangible, man-made object that can provide insight into the beliefs and practices of the individual(s) and/or group(s) that created and/or use it.

An artifact is an item that is not purchased, but instead is provided to the public free of charge.

    - Examples of Landscape Investigation artifacts: Flyers, brochures, newspapers and/or newspaper articles, store coupons, copies of photos, maps, business cards, student-generated photographs, etc.

2. Discuss how an artifact might enhance the information gathered related to the focus question by providing deeper insight into an issue or topic.

3. Explain to the students the protocols for collecting artifacts:

    - Ask before taking any artifact – unless clearly marked as free.
    - DO NOT remove artifacts that are posted in public places or on displays.
    - Be intentional about collecting artifacts – don't just grab everything.
    - Do not take pictures of people, only places and items in the environment.

Note: If desired, students can take cameras into the field on the day of the field study. Prior to the experience, spend time discussing appropriate photos. In the case of the Connective Inquiry, pictures of people's faces are not desired. Instead, students should focus on pictures that depict places, structures, and patterns. If people are captured in student-taken images, faces should not be visible or clear. However, if a store owner or community member provides students with photos as artifacts, this is acceptable.

Activity 5: Thank You Notes

1. Discuss with students the fact that interviewees will essentially be donating their time to the students as they answer questions and/or provide artifacts.

2. Work with the students to create thank you notes or cards to be distributed by student teams to each interviewee. These cards can include information such as a brief summary of the student project goals, teacher name and contact information, and even an invitation to student presentations that will take place at the end of the project. (See Example Thank You Note, Appendix G)

3. Make copies of the thank you cards and distribute them to student teams the day of the Field Study.

Step 4: Research: The Field Study

Learning Level
Advanced Learner

NGSS Standards
HS-ETS1-1 Engineering Design

NCSSS Standards
Theme 2: Time, Continuity, and Change
Theme 3: People, Places, and Environments
Theme 5: Individuals, Groups, and Institutions

Objectives
Students will:

- Navigate and explore a location while collecting information and data through observations, interviews and artifacts.
- Participate in a small and/or whole group debriefing - reporting on observed patterns, relationships and contradictions to prior research.

Materials

- Cell phone (personal or one from the school)
- Master list of students and chaperones (with cell phone numbers)
- Nametags
- Copies of the Field Study Itinerary – (A teacher-created document with written directions, and a map if desired, that highlight student roles/responsibilities, area boundaries, the timeline for the day and emergency contact information)
- All students' Field Study Journal and documents (created by students in Step 3)
- Note-taking materials for each student (paper, pencils)
- Thank you cards for each group to give to community members, businesses, etc. (see Appendix G)
- Copies of the Your Role as a Chaperone document (see Appendix G)

Time Needed
One 2 to 3-hour session

Technology Options
Google Maps

Background

During the field study, students are immersed in an in-depth exploration of the location they have researched through static maps and charts. While in the field for 2 to 3 hours, students gather additional information related to their Focus Question through intentional observations, interviews, and artifacts. As students walk the streets and connect with multiple points of view, they are able to actively observe the relationships between the physical and human features of the place while also examining first-hand the spatial, ecological, economic, and historical perspectives of that location.

Upon completion of the field study, while still in the field, the students participate in a debriefing session. Through thoughtful discussion of both prior knowledge and new insights that address the focus question, students enhance and internalize their understanding of spatial relationships and the impact of those relationships on the environment.

Process

Prior to the day of the trip:

1. Create a Field Study Itinerary. This document should include written directions, and a map if desired, that highlights student roles/responsibilities, area boundaries, the timeline for the day (with stop and start times – 2 to 3 hours is appropriate), designated numbers (total number of people to interview, artifacts to collect, etc.) and emergency contact information.

2. Gather all necessary materials:

    - Master list of students and chaperones (with cell phone numbers)
    - Nametags
    - Copies of the Field Study Itinerary
    - All students' Field Study Research journals and documents
    - Note-taking materials for each student (paper, pencils – the journal binders can double as clipboards, especially if you give each student a binder clip)
    - Thank you cards for each group to give to community members, businesses, etc. (see Appendix G)
    - Copies of the Your Role as a Chaperone and Emergency Contacts and Procedures documents (See Appendix G)

3. Verify pick–up and drop-off times with your transportation department.

4. Confirm chaperone attendance.

Process

On the day of the trip:

1. Upon arriving at the drop-off location within the boundaries of the field study area, have student teams review the Field Study Itinerary.

2. In the meantime, pull all chaperones together to discuss their roles and responsibilities. (Distribute copies of the Your Role as a Chaperone and Emergency Contacts and Procedures.)

3. Bring students together with the chaperones. Discuss any final instructions, remind students about the number of people they should interview/artifacts they should collect, as well as the thank you notes they should hand out, and send them off to conduct their investigations.

4. Circulate throughout the area, checking in with teams and chaperones.

5. Arrive at the designated meeting location at the end of the field experience at least 10 minutes early to prepare for debriefing.

6. Once student teams and chaperones arrive, discuss (either in small groups and/or as a whole group discussion for 15-20 minutes) all or some of the following:

    - What is the most interesting observation you made today related to your focus question?
    - Did any observations or interview responses contradict your expectations or prior research? Explain.
    - What new patterns or relationships emerged from your experience today?
    - What is something you learned today from walking the streets, interviewing individuals and collecting artifacts that you would not be able to learn from looking at static maps and charts?

7. As students board the bus, collect their notes and documents (journals) for use in the classroom during *Step 5: Organizing, Analyzing and Communicating*.

Step 5: Organize and Communicate

Learning Level
Advanced Learner

NGSS Standards
HS-ETS1-1 Engineering Design

NCSSS Standards
Theme 2: Time, Continuity, and Change
Theme 3: People, Places, and Environments
Theme 5: Individuals, Groups, and Institutions

Objectives
Students will:

- Organize information and data collected during classroom and field research as it relates to the focus question.
- Work collaboratively to review information and data, looking for patterns and relationships between the physical/natural and human/cultural components and the 4 geographic perspectives – Spatial, Ecological, Economic, Historical (SEEH) - in a given place.
- Create visual representations and written summaries of information/data analysis to address the Focus Question.
- Present analyses and summaries to stakeholders and peers.

Materials

- All student summaries, notes, artifacts and other documents from research and field experience
- Paper, colored pencils, computers, and other resources to assist with the creation of written summaries and visual representations of information and data analysis

Time Needed
Two to three 50-minute periods

Technology Options
Google Maps

Background

The culmination of the Landscape Investigation is the organization, review, and communication of student research that addresses the Focus Question. Students first debrief one another about their field study experiences, revisiting their predictions and writing reflections. Then, they work as teams to compile their maps, field notes, documents, and artifacts to summarize the community member responses related to the Focus Question as well as the observed patterns and relationships between physical and human features (spatially, ecologically, economically and historically).

Upon completion of data review and summarization, the students determine the most effective way(s) to represent and communicate their findings related to the Focus Question in both visual and written formats. The processing and presenting of their data further deepens the students' abilities to interpret the complex relationships between the physical and human components within a location.

Process

1. Have students gather all notes and materials related to their Landscape Investigation, including the laminated maps, initial descriptions, and summaries.

2. Before in-depth analysis of their experience occurs, first have students debrief by reflecting on the field study (in writing or verbally).

    - What discoveries really surprised you?
    - What things did you learn that you didn't know?
    - What did you already know about that you now have a deeper understanding of or can appreciate more?
    - Should we do this type of study again?
    - What would you change? What would you keep the same?

3. Share and discuss reflections about the field study.

4. Upon completion of personal reflections, students will work collaboratively in their teams to discuss what they have learned about the place in relation to their focus question, utilizing their maps and notes (observations, summaries, interview responses) from both classroom and field research.

    Students should discuss and prepare to summarize their findings concerning patterns and relationships between physical and human characteristics and the SEEH perspectives. Students can refer to Table 6 and Table 7 for guiding questions.

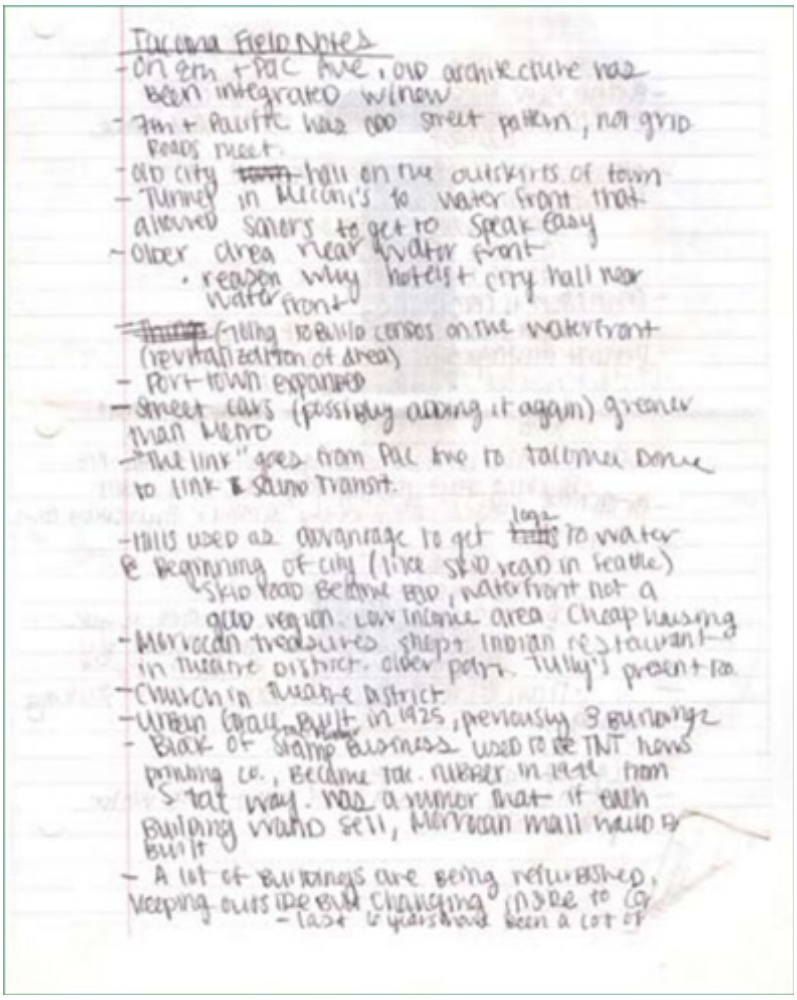


Figure 3. Student Team Field Notes

5. Following small group and/or classroom discussions, students work with their teams to interpret and represent their findings through visual and/or graphic forms (linear maps, graphs, timelines, cognitive maps, PowerPoint presentations, etc.) and/or a written summary, both of which should address the focus question and the SEEH perspectives.

   Students must document all sources utilized while creating their summaries, including field study interviews, artifacts, websites, maps, etc. on a bibliography page.

   Note: It is strongly recommended that students do not name people and businesses specifically when discussing perspectives. The goal of the presentation is to reflect the overall findings, not views of particular groups. (This can be particularly important if students are researching contentious issues.)

6. Upon completion, arrange for students to present their findings/summaries to stakeholders from the community and/or with their peers.

APPENDIX A: ORIGINAL PREFACE AND ACKNOWLEDGEMENTS

Preface

At the heart of social science inquiry is curiosity about the place in which we live. This curiosity, underused and underdeveloped by our current 4–12 curricula, is fostered by the landscape investigation model presented in this guide. Landscape investigation creates opportunities for students to gain problem-solving skills and promotes creative real-world learning by providing a framework for exploring questions about sustainability and the quality of life in the 21st century (Nolet 2009). As students focus on a long-term project that incorporates multiple learning styles and experiences, they apply key social science perspectives to help them sort through the complex systems that make up their communities. In addition to developing the thinking skills they need to understand complex systems, they acquire skills that can be used in other social science inquiry situations in academic and non-academic settings. Most importantly, landscape investigation teaches students the process of change by showing them how to use spatial inquiry to discover patterns between natural and human systems (Curriculum 21, 2009). Because the inquiry process also fosters creativity, innovation, and the ability to work effectively with others to develop knowledge and solve real problems, it cultivates civic participation: Students actively add knowledge to their community's understanding of an area. Social studies inquiry helps students understand their civic place in the world and is a prerequisite to civic action (NCSS 1994).

A panel of professors, teachers, and practitioners was convened to assist in the creation of the landscape investigation model and to ensure that it supports systematic investigation that meets 4–12 social science and geographic academic standards. Moreover, by providing a framework for the student's performance and the products that come out of their inquiries, the landscape investigation model allows students to demonstrate their capabilities. While teachers serve as facilitators, the students have control of their learning and own their growth in complex thinking.

Participation in landscape investigation prepares students for and engages them in the academic, occupational, personal, and practical challenges of life in a dynamic global environment. As the world population approaches eight billion as of 2021 and resources become increasingly scarce, our communities will need citizens who are well equipped to address the challenges ahead. The landscape investigation process gives students the experience and intellectual tools they will need to meet this need. At the same time, the inquiry experience helps students develop an enduring and useful understanding of the place in which they live (Sobel, 2005; Wiggins and McTighe, 2006).

Acknowledgements

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Margaret Tudor, Executive Director Pacific Education Institute

"The great thing about landscape investigation is that it engages kids in issues of place and gives them multiple stakeholder perspectives first hand from the people they interview. What might appear to be a fun field excursion walking around town talking to locals blossoms into an engaging, relevant, and authentic learning experience. Physical, cultural, and political geographies are fused and come alive through landscape investigation."

Eric Wickwire, Teacher

APPENDIX B: LANDSCAPE INVESTIGATION IN PRACTICE

Because landscape investigation can be incorporated into a variety of educational settings, this section explores a few examples to demonstrate the framework's applicability and flexibility and to stimulate the reader's own ideas. As you will see, this social science inquiry methodology lends itself to rich learning opportunities wherever it is implemented.

Landscape Investigation in Practice: Student Examples

The following examples illustrate the three phases of inquiry—Spatial, Connective, and Analytical—used by researchers to conduct a landscape investigation. In each example, students apply the process of inquiry to study the landscape of their local community.

An Example of Spatial Inquiry. Just like explorers of the past (e.g., Lewis and Clark), students in North Bend, Washington, explored their built environment and used their observation skills to discover relationships. To begin this process, they looked for an "indicator" business. (Indicator businesses tend to reveal shifts in the economic and demographic profile of a community. A dry-cleaning business, for example, can be sustained in a community only when the demographics of the service area include a critical mass of people who own the type of materials that require this service and who are affluent enough to pay for it.)

The student teams started in the townscape of North Bend and chose to go to the local businesses to interview the owners. They walked an eight-block area. Their first interview was in a business that rents power tools and equipment. This business was locally owned until a year ago when a man from Microsoft bought it. The students learned that the workers like the new owner, who leaves them to run the business. The students next went to the dry cleaners and learned about the Korean owners who had moved from the south Seattle area and who try to use environmentally friendly products in their business. The team also interviewed a bicycle shop owner who came from California after conducting a needs-assessment in the area to identify what businesses might be needed.

Teams also conducted an interview at the local burger stand and found out that the owner is the mayor of the town. He related that there is a water moratorium in the city and lots of growth is happening outside the town. The mayor wants to prevent development.

Spatial learning: From their investigation of the present configuration of the town, the students learned that North Bend used to be a small, closed community, but that recently people from elsewhere began moving into the town, such as the Korean dry cleaners or the Californian who runs the bicycle shop. More Microsoft employees and retirees are moving into the outskirts of North Bend. This is indicative of what happened to the town over time: Wealthy people, many of whom moved to the town from elsewhere, now significantly affect the community of North Bend. They impact North Bend's mosaic of businesses, its spatial organization, and the sustainability of its resources. Many of these wealthy newcomers like the idea of progress with not much change.

As a result of their analysis of the spatial, ecological, economic, and historical findings, the students began to ask more questions about the townscape. This led the students to conduct a deeper, connective inquiry, which allowed them to draw connections between their spatial, ecological, economic, and historical observations and to answer questions or make predictions about the relationships between them.

An Example of Connective Inquiry. In walking around the town of North Bend, the students found that certain businesses, such as a burger joint, were located in close spatial relationship to the major highway, Interstate 90, which connects Spokane with Seattle. They asked whether the highway had some bearing on why these businesses appeared in the community (ecological analysis). Their research revealed a business movement: Because I-90 had been moved from downtown to a few miles away, North Bend became a ghost town for about 20 years (historical analysis). To spur growth, the community had to find out how to get people into town. This led to the construction of outlet stores and fast food joints, because these businesses can be sustained by the traffic off the highway (economic analysis).

As a result of digging deeper, the students discovered a problem related to the ecological status of North Bend. They then took steps to learn more about this specific problem by applying a spatial analysis. The spatial analysis allowed the students to understand the complexity of the system—in particular, how changes affecting North Bend's relationships to other elements of the landscape (such as its proximity to a travel corridor) can impact the demographics, the economy, and the spatial arrangement of the community. Moreover, the students were able to appreciate that people must first understand the relationships between points in a system if they are to develop and implement changes that solve problems.

An Example of Analytical Inquiry. The final example shows how students near North Bend applied the correlative inquiry methodology to their observations of another problem associated with the I-90 travel corridor adjacent to their community. First, they noted that a lot of elk were getting killed on a particular section of the road. The students used the local sheriff's reports to identify where the elk were killed and plotted these points on a map. Upon analyzing the map, they found that a section of the road was being used as a wildlife corridor by elk. No one knew about the wildlife corridor prior to this study. Using this information, the students could take several types of civic action, including eco-management: Fencing the area to prevent elk crossing, posting road signs, and working with the local government to develop elk management plans (e.g., wildlife bridges).

Conclusion. As these three examples of spatial, connective, and analytical inquiry illustrate, the landscape investigation model ensures that students are actively engaged in the process of learning. Students apply systematic inquiry methodologies to discover the relationships between geographic (spatial), ecological, economic, and historical features. They learn to recognize and assess the patterns of change in their townscapes and to contemplate the implications for the future. Because the students investigate the features and relationships of their own townscape, they also have the opportunity to identify the practical applications of their inquiry and, in some cases, to address the puzzles or problems they discover by initiating further inquiries or taking civic action.

While the landscape investigation model emphasizes learning through inquiry, it also recognizes that students need guidance as they draw meaning from their experiences (for the importance of such guidance, see Bain 2005). The teacher's primary role in landscape investigation is to guide students toward the development of skills and thinking processes that enable them to participate in a "community of shared, disciplinary expertise" (p. 203) as they deepen their inquiry through analysis, further questioning, and investigation.

Learning by Doing: Teachers Conduct Landscape Investigations

In-Service Training for Teachers, Example #1 – LaConnor, Washington

During a summer geography institute, a group of teachers from around the country converged on the small town of LaConnor. They spent the morning hours learning how to conduct a landscape investigation, which included how to have successful interviews with locals. They then spent nearly four hours accessing the geographic story of this town. They discovered that the town's economic situation had changed dramatically since the town's inception and early years.

In-Service Training for Teachers, Example #2 – Eatonville, Washington

During yet another summer geography institute, teachers converged on the upland town of Eatonville. Here, they interviewed the owner of the town's pharmacy, who seconded as the mayor governing small-town politics, and the latte-stand owner, who has lived in the town for the past forty-five years. The participants discovered that after-school teen programs face major challenges. They also discovered that one of the town's Victorian-style houses was a front for a speak-easy during prohibition, and that this portion of the house is still in use. After learning their way through the process of landscape investigation, teachers had an invigorating experience that they then took back to their classrooms.

Landscape Investigation for Schools

Students Conduct Landscape Investigations, Example #1 – Seattle, Washington

Students in junior high first went through the introduction to landscape investigation in their classrooms. They then traveled to downtown Seattle to conduct their work. They interviewed businesspeople and other locals and made note of the historical markers and other circumstances they observed in the urban landscape. The students developed a new understanding of the urban center.

Students Conduct Landscape Investigations, Example #2 – Tacoma, Washington

During their AP human geography course, students in Tacoma were involved in a unit about the urban world. Within the urban unit, students studied both the spatial patterns of the Central Business District (CBD) as well as how the sequential occupancy patterns of business and residential dwellings change over time to reflect societal values. Students then learned the landscape investigation processes, worked on proper interviewing techniques, and turned in their field-trip forms to participate in the field study. On the day of the field study, the students were given a map of the CBD. They exchanged their cell phone numbers with the teacher and chaperones and began their work on understanding the story of Tacoma from a geographic standpoint. When they had concluded their field work, they met at an auditorium, where they conducted a group debriefing to review their investigation.

Students Conduct Landscape Investigations Abroad, Example #3 – San Ignacio, Cayo District, Belize

While on student-travel excursions, geography students have opportunities to conduct landscape investigations in foreign countries. One such opportunity was in the town of San Ignacio in the Cayo District of Belize. Once there, the students analyzed the townscape patterns of a Central American city and how it differed from that of towns in the United States. After working in groups, the students met at the local soccer stadium to debrief.

Student Travel Service Providers Conduct Landscape Investigations Abroad, Cumbremayo, Cajamarca District, Peru

Although the audience was unique in that most of the participants were providers of student travel, the outcome was the same: A powerful in-the-field-experience in the landscape. The participants spent the day at Cumbremayo, 17,800 feet above sea level in the Andes Mountains of Peru. Here, they went through a landscape investigation process to explore pre-Incan water diversion systems. The participants had more questions than answers as they speculated on the reason for the water diversion, the placement of it, the materials made from it, and the changes that occurred to help benefit Peruvians of the past.

"I learned about why certain areas are built they way they are. Through observing the city, I was able to figure out how the city was built to provide for the common welfare of the people in the city—whether that be through jobs or even providing entertainment at the local theatre."

—Kelsey, Student

APPENDIX C: NATIONAL RESOURCES: PROJECT WILD AND PROJECT LEARNING TREE

	Project WILD	Project Learning Tree
Spatial Inquiry		Places We Live: Community Character Places We Live: Neighborhood Design
Spatial Perspective	Project WILD: Shrinking Habitat Science & Civics: Then and Now	Places We Live: Mapping Your Community through Time • Maps & Map Features • Zoning & Regulations • Water and Wastewater • Housing PLT: On the Move PLT: Our Changing World
Ecological Perspective	Project WILD: Wildlife Bibliography	Places We Live: Mapping Your Community through Time • Green Infrastructure • Green Inventory Places We Live: Green Space PLT: Then and Now
Economic Perspective	Project WILD: Pay to Play Project WILD: Lobster in Your Lunchbox	Places We Live: Mapping Your Community through Time • Business & Industry • Transportation
Historic Perspective	Project WILD: Museum Search Project WILD: Changing Attitudes	Places We Live: Mapping Your Community through Time • Research Hints PLT: Did You Notice
Connective Inquiry	Science & Civics: • Who Cares-Stakeholder Interaction chart • Who Cares-Stakeholder Analysis chart • Then and Now: Human related changes Participatory Democracy – Who Cares?	PLT: Invasive species Places We live: A Vision for the Future

APPENDIX D:
CLE ELUM/ROSLYN CASE STUDY

Landscape Investigation

Walter Strom Middle School
Cle Elum-Roslyn School District Lisa Browitt
8th Grade Social Studies/Language Arts Teacher

"The Cle Elum-Roslyn School District is committed to connecting our Students and Staff to our Natural World and Cultural Heritage, fostering Stewardship of Place."

In an effort to support the mission statement of the Cle Elum-Roslyn School District, my 8th-grade students conducted a "Landscape Investigation" in the Upper Kittitas County communities of Roslyn and Cle Elum. The students studied the history of these towns in an attempt to understand how that history has influenced the present. After formulating questions and talking with business owners, students were able to make predictions about the future of these communities based upon this work.

The Process

- My classes begin a study of the local history of the Upper Kittitas County in the fall through an integrated Social Studies/Language Arts Unit. We read the historical fiction book "Cuss" by Kristine Franklin. "Cuss" is a fictional account of a boy growing up in coal-mining Roslyn during the 1920s. This provides a framework for our study of the historical, cultural, and economic history of the area. A walking trip to the remains of one of the area coal mines is included in our study.

- As a part of our study of our natural landscape, we begin a unit of study on the Yakima River Watershed and our connection to it. This unit includes elements of natural science as well as an examination of historical, cultural, and economic uses of the Yakima River. Language Arts lessons are also included in this unit.

- After completing a unit of study on the general history of our area, we begin to focus on what is currently happening in our communities. General discussion and research is conducted about issues such as the location of a large resort near our towns, the proposed development of large housing tracts on the ridges above the communities, and a proposed construction of a large solar plant in a nearby valley.

- Students were asked to choose a partner, and then were paired with two other students to form teams of four for their specific, focused field work. This team then worked together to develop an overarching, or focus question, for their project. Students brainstormed as a class and then refined the question in their teams.

- As teams of four, students brainstorm a list of possible questions to ask the individuals they will meet in Roslyn or Cle Elum. As a class, the students evaluate all questions to develop a generic list of questions for their community visits. Questioning techniques and 'etiquette' for the visit are also reviewed at this time.

- Each team was asked to discuss and develop predictions for what they expected to learn during their trip to Roslyn or Cle Elum. These predictions would be based on the background research the students had completed and class discussions on the key issues in each community.

- Because our communities have a limited number of businesses, I assign specific businesses/locations for each team of four. The students then have an opportunity to do more specific research on their assigned sites prior to actually visiting them.

- Each team of four is assigned an adult chaperone. The chaperone acts as an observer and does not participate in the investigation itself.

- We allowed two hours for our teams to visit four to seven different businesses/sites. This proved to be more than adequate for our small towns. Students were encouraged to take pictures of the businesses they visited and, if possible, use them to compare to historic photos of those same sites.

- Following each interview, the teams gave a 'thank you' card to each individual interviewed, thanking them for their time and inviting them to our annual Celebration of Student Learning where the projects would be presented.

- We conducted the trip debrief upon our return to the classroom. Students were encouraged to revisit their notes at this time and complete or add to any that were incomplete.

- A review of the Landscape Investigation PowerPoint was important at this point. Reminders of the project components helped students begin the process of compiling their information into a project format that would be ready for presentation to their classmates and the community at the Celebration of Student Learning.

- Revise, revise, and more revision to arrive at a product that reflected the learning that took place during this investigation.

<u>Outcomes:</u>

• The goal of this Landscape Investigation was to give students an understanding of how people view their communities, what roles projected development may have on the community, and what needs the community may have. It gives the students an opportunity to understand and experience the role that the past has on what we experience here today.

• Students expressed their surprise at how complicated issues are 'even in a small town of our size'. They were more aware of how difficult it would be to make decisions since they encountered so many different opinions relating to our communities' future.

• Since, as a District, we believe that young people will be better stewards of those places that they understand and value, this activity truly supports that goal. Following our field work, one of my students visited a new business in Cle Elum. The student told me that she asked many of the same questions of this new business owner that she had used in her L.I. field work. She said that this work has really changed how she views her town. She had no idea this place had such layers and was so interesting!

"It is essential that pupils have the opportunity to explore geography through both firsthand out-of-classroom experiences and the wealth of other resources available. They are growing up in an ever more connected world ,and it is vital that children have the chance in school to understand and question what is happening on our planet."

–John Halocha, Reader in Geography Education, Bishop Grosseteste University College, Lincoln

Burgers With a Side of History

Exploring the Past to Understand the Present

Walter Strom Middle School **(Cle Elum/ Roslyn School District)**

By: Cody, Brennan, Caleb, and Robbie

Introduction

Our investigative team has been studying the small town of Roslyn, Washington's past and present qualities, in hopes that it will give us an idea of what Roslyn's future will look like. This entire project is called a "Landscape Investigation" and it has taken us about a full month to collect all of our data which you will now see displayed on our poster.

Investigative Question

How does Roslyn's past and present affect its future?

Predictions

We predicted that the people from our organizations and businesses would say that Suncadia has slightly improved the amount of customers or visitors. We predicted that they would dislike the No. 6 Canyon Development due to the amount of people being brought into the area. We thought they would like the Teanaway Solar Energy Plant due to the use of natural electricity that may be needed in the future.

Methods

Our research started by reading through old documents from local history books. These pages didn't exactly have the information we were looking for so we turned to online research. Our main goal was to look for anything that would give us an idea of what Roslyn was like back when it was one of the largest cities in Kittitas County. Then on the 27th of April our entire 2nd block went to Roslyn. Our investigative team was assigned local businesses to go to and interview the employees. Our teacher had us come up with questions in class that we would ask the businesses before we even came to Roslyn. Altogether we spent about two hours interviewing the employees and asking them questions such as, what they did or didn't like about Roslyn, and how they felt about the new developments being planned. After collecting all the data we thought we would need, we headed back to the school to go through all our information and were able to compile it into the poster you see now.

Results

Through our "Landscape Investigation" we discovered the opinions on the future of Roslyn from businesses and the town museum. We found that the telecommunication business we visited felt that the No. 6 Canyon Development would be good for their business due to the increase in customers. On the other hand the restaurant and the museum thought that the development would bring in too many people and disturb the natural environment. From the two businesses we found that Suncadia has improved the amount of customers they see regularly. We also found that the museum has had more visitors coming to learn about Roslyn's past thanks to recommendations by Suncadia employees. When we mentioned the Teanaway Solar Development the businesses and the museum saw it as a positive development because solar energy is eco friendly, helping to preserve the natural environment.

Conclusion

We conclude that in the near future Roslyn will grow in size. This is due to the large developments that are being planned in the Roslyn area such as the No. 6 Canyon Development, and the Teanaway Solar Plant. People's feelings about these developments vary greatly; some like how Roslyn is a small tight knit community, and already feel that the small town has become too much of a city. This is because not too long ago you could walk down the streets of Roslyn and know every single person you saw. Then on the other hand others think that more people will be a great benefit to their business and have no issues with the new developments. In addition there is the conflict of Suncadia's influence over Roslyn, but according to everyone we interviewed Suncadia has been a great benefactor. This is because not only do the people from Suncadia come down to Roslyn while they're on vacation, but apparently sometimes Suncadia employees will suggest that people go down to Roslyn and learn about its rich history. So altogether our predictions were both right and wrong at the same time. For instance we were correct in predicting that Suncadia has helped the local businesses by bringing in more people. But on the other hand we predicted they would dislike the No. 6 Canyon Development and like the Teanaway Solar Energy plant, when really there was mixed feelings on both issues.

Sources

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A History of Kittitas County, Washington. 1915. Volume I. Kittitas County Centennial Committee, 1989.

A Pictorial History of Kittitas County, Washington. 1989. Volume II. Kittitas County Centennial Committee, 1989.

Hinderer, John C. Coal Towns in the Cascades: A Centennial History of Roslyn and Cle Elum, Washington. Melior Publications: Spokane, Washington. 1988.

Spawn of Coal Dust: History of Roslyn, 1886-1955. Operation Uplift Community Development Program. 1975.

APPENDIX E:
STUDENT EXAMPLE

APPENDIX F:
INFORMED CONSENT

All research with human subjects requires ethical considerations. Below is an example template for an Informed Consent text that students should use when interviewing members of the community. This information was gathered from: Research Ethics and Compliance University of Michigan, and similar information can be found through any university conducting human subject research.

Informed consent is the process of telling potential research particpants about the key elements of a research study and what their participation will involve. The informed consent process is one of the central components of the ethical conduct of research with human subjects. The consent process typically includes providing a written consent document containing the required information (i.e., elements of informed consent) and the presentation of that information to prospective participants.

For purposes here, we suggest that students create an informed consent dialogue suited to their specific project and that this dialogue is read before any interviews are conducted. Sections should include:

Student Introduction
Background about the project
What is being asked of the participant and that they are welcome to stop the interview at any point
Assurances of confidentiality

Example informed consent forms are readily found online.

APPENDIX G: YOUR ROLE AS A CHAPERONE, EMERGENCY CONTACTS, AND PROCEDURES HANDOUTS AND EXAMPLE THANK YOU NOTE

Your Role as a Chaperone

Thank you for volunteering to chaperone our Landscape Investigation field experience. Today, the students will be exploring_____as they investigate their Focus Question:

Your primary concern is the safety of the students.

1. Keep the group together at all times

2. Make sure the students follow all traffic and pedestrian laws, especially when crossing the street.

3. Make sure the students stay within the designated boundaries (see the Field Study Itinerary) to make observations, conduct interviews and collect artifacts. (NOTE: An artifact is an item that is provided for free to the public.)

4. Allow the students to determine where to go, who to talk to and what to collect. Observe students as they conduct their investigations, but do not participate.

Emergency Contacts and Procedures

*In the case of a life-threatening emergency, contact 911.
Teacher or school cell phone #:
If a student is injured:
If a student is missing:

Example Thank You Note

THANK YOU!

for participating in our Landscape Investigation!

We invite you to review our results
when we display our projects
at our annual
Student Learning Celebration

Wednesday, May 24, 2011
5:00 to 7:00 p.m.
Your Middle School

Questions? Please call Teacher Name at 555-5555

APPENDIX H: ALIGNMENT OF LANDSCAPE INVESTIGATION WITH THE NEXT GENERATION SCIENCE STANDARDS AND THE NATIONAL CURRICULUM STANDARDS FOR SOCIAL STUDIES

The Next Generation Science Standards (NGSS) are K-12 science content standards and set the expectations for what students should know and be able to do. The NGSS call for a three-dimensional approach to science instruction and represents a range of information empowering educators, administrators, parents, and the general public to help bring science to life.

The National Curriculum Standards for Social Studies (NCSSS), first published by the National Council for the Social Studies (NCSS) in 1994, provide a framework for professional deliberation and planning about what should occur in social studies programs in PreK-12 grades. The framework provides ten themes that represent a way of organizing knowledge about the human experience in the world.

The following table demonstrates how the Landscape Investigation Guidelines integrate both the NGSS and the NCSSS information providing professionals the necessary guidance in lesson implementation.

Landscape Investigation Guidelines: Challenging 4-12 Students to Engage in Social Science Inquiry by Applying Spatial Thinking to Real World Solutions				
Chapter 2: Building Spatial Skills				
Activities	NGSS	NCSSS	Suggested Technology	Embedded Activities
Step 1: Understand Space, pp. 13-14	3-5-ETS1-1 Engineering Design; 5-ESS2-1 Earth's Systems	Theme 2: Time, Continuity, and Change	Google Maps	Define space; create map of school campus
Step 2: Define Place, pp. 15-17	3-5-ETS1-1 Engineering Design; 5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics	Theme 2: Time, Continuity, and Change Theme 3: People, Places, and Environments	Google Maps	Define place; identify components of and connections/relationships on school campus
Chapter 3: Spatial Inquiry				
Step 1: Organize, pp. 20-21	MS-ETS1-1 Engineering Design	Theme 2: Time, Continuity, and Change Theme 3: People, Places, and Environments	Google Maps	
Step 2: Develop Base Map, p. 22	MS-ETS1-1 Engineering Design; MS-LS2-3 Ecosystems: Interactions, Energy, and Dynamics	Theme 2: Time, Continuity, and Change Theme 3: People, Places, and Environments	Google Maps	
Step 3: SEEH the Location, pp. 23-25	MS-ETS1-1 Engineering Design; MS-LS2-3 Ecosystems: Interactions, Energy, and Dynamics	Theme 2: Time, Continuity, and Change Theme 3: People, Places, and Environments	Google Maps	
Step 4: Summarize, p. 26	MS-ETS1-1 Engineering Design; MS-LS2-3 Ecosystems: Interactions, Energy, and Dynamics	Theme 2: Time, Continuity, and Change Theme 3: People, Places, and Environments	Google Maps	

Chapter 4: Connective Inquiry				
Step 1: Developing a Focus Question, pp. 30-31	HS-ETS1-1 Engineering Design	Theme 2: Time, Continuity, and Change Theme 3: People, Places, and Environments Theme 5: Individuals, Groups, and Institutions	Google Maps	
Step 2: Design and Predict, pp. 32-34	HS-ETS1-1 Engineering Design	Theme 2: Time, Continuity, and Change Theme 3: People, Places, and Environments Theme 5: Individuals, Groups, and Institutions	Google Maps	
Step 3: Prepare, pp. 35-40	HS-ETS1-1 Engineering Design	Theme 2: Time, Continuity, and Change Theme 3: People, Places, and Environments Theme 5: Individuals, Groups, and Institutions	Google Maps	
Step 4: Research, pp. 41-42	HS-ETS1-1 Engineering Design	Theme 2: Time, Continuity, and Change Theme 3: People, Places, and Environments Theme 5: Individuals, Groups, and Institutions	Google Maps	
Step 5: Organize and Communicate, pp. 43-44	HS-ETS1-1 Engineering Design	Theme 2: Time, Continuity, and Change Theme 3: People, Places, and Environments Theme 5: Individuals, Groups, and Institutions	Google Maps	

Students who demonstrate understanding can:

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

The performance expectation above was developed using the following elements from the NRC document *A Framework for K- 12 Science Education:*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. • Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.	ETS1.A: Defining and Delimiting Engineering Problems • Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.	Influence of Science, Engineering, and Technology on Society and the Natural World • People's needs and wants change over time, as do their demands for new and improved technologies.

Connections to 3-5-ETS1.A: Defining and Delimiting Engineering Problems include:

Fourth Grade: 4-PS3-4

Articulation of DCIs across grade-levels:

K-2.ETS1.A ; MS.ETS1.A ; MS.ETS1.B

Common Core State Standards Connections:
ELA/Literacy -
(W.5.7) Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-1)

(W.5.8) Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3-5-ETS1-1)

(W.5.9) Draw evidence from literary or informational texts to support analysis, reflection, and research. (3-5-ETS1-1)

Mathematics -
(MP.2) Reason abstractly and quantitatively. (3-5-ETS1-1)

(MP.4) Model with mathematics. (3-5-ETS1-1)

(MP.5) Use appropriate tools strategically. (3-5-ETS1-1)

(3-5.OA) Operations and Algebraic Thinking (3-ETS1-1)

Students who demonstrate understanding can:

5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K- 12 Science Education:*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop a model using an example to describe a scientific principle.	ESS2.A: Earth Materials and Systems • Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.	Systems and System Models • A system can be described in terms of its components and their interactions.

Connections to other DCIs in fifth grade: N/A

Articulation of DCIs across grade-levels:

2.ESS2.A ; 3.ESS2.D ; 4.ESS2.A ; MS.ESS2.A ; MS.ESS2.C ; MS.ESS2.D

Common Core State Standards Connections:
ELA/Literacy -
RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-ESS2-1)

SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS2-1)

Mathematics -
MP.2 Reason abstractly and quantitatively. (5-ESS2-1)

MP.4 Model with mathematics. (5-ESS2-1)

5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS2-1)

Students who demonstrate understanding can:

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. [Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education:*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 3–5 builds on K–2 models and progresses to building and revising simple models and using models to represent events and design solutions. • Develop a model to describe phenomena. Connections to the Nature of Science Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena • Science explanations describe the mechanisms for natural events.	LS2.A: Interdependent Relationships in Ecosystems • The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. LS2.B: Cycles of Matter and Energy Transfer in Ecosystems • Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment.	Systems and System Models • A system can be described in terms of its components and their interactions.

Connections to other DCIs in fifth grade:
5.ESS2.A ; 5.PS1.A

Articulation of DCIs across grade-levels:
2.PS1.A ; 2.LS4.D ; 4.ESS2.E ; MS.PS3.D ; MS.LS1.C ; MS.LS2.A ; MS.LS2.B

Common Core State Standards Connections:
ELA/Literacy -
RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-LS2-1)

SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-LS2-1)

Mathematics -
MP.2 Reason abstractly and quantitatively. (5-LS2-1)

MP.4 Model with mathematics. (5-LS2-1)

Students who demonstrate understanding can:
MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education:*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models. • Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.	ETS1.A: Defining and Delimiting Engineering Problems • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions.	Influence of Science, Engineering, and Technology on Society and the Natural World • All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. • The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.

Connections to MS-ETS1.A: Defining and Delimiting Engineering Problems include:
Physical Science: MS-PS3-3

Articulation of DCIs across grade-bands:
3-5.ETS1.A ; 3-5.ETS1.C ; HS.ETS1.A ; HS.ETS1.B

Common Core State Standards Connections:
ELA/Literacy -
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1)

WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ETS1-1)

Mathematics -
MP.2 Reason abstractly and quantitatively. (MS-ETS1-1)

7.EE.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1)

Students who demonstrate understanding can:

MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.] [Assessment Boundary: Assessment does not include the use of chemical reactions to describe the processes.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education:*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop a model to describe phenomena.	LS2.B: Cycle of Matter and Energy Transfer in Ecosystems • Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.	Energy and Matter • The transfer of energy can be tracked as energy flows through a natural system. - Connections to Nature of Science Scientific Knowledge Assumes an Order and Consistency in Natural Systems • Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation.

Connections to other DCIs in this grade-band:
MS.PS1.B

Articulation of DCIs across grade-bands:
5.LS2.A ; 5.LS2.B ; HS.PS3.B ; HS.LS1.C ; HS.LS2.B ; HS.ESS2.A

Common Core State Standards Connections:
ELA/Literacy -
SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS2-3)

Mathematics -
6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS2-3)

Students who demonstrate understanding can:

HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education:*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations. • Analyze complex real-world problems by specifying criteria and constraints for successful solutions.	ETS1.A: Defining and Delimiting Engineering Problems • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.	*Connections to Engineering, Technology, and Applications of Science* Influence of Science, Engineering, and Technology on Society and the Natural World • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Connections to HS-ETS1.A: Defining and Delimiting Engineering Problems include:
Physical Science: HS-PS2-3, HS-PS3-3

Articulation of DCIs across grade-levels:
MS.ETS1.A

Common Core State Standards Connections:
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. (HS-ETS1-1)

RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-ETS1-1)

RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (HS-ETS1-1)

Mathematics -
MP.2 Reason abstractly and quantitatively. (HS-ETS1-1)

MP.4 Model with mathematics. (HS-ETS1-1)

SHORT LIST OF TERMS

Short List of Terminology

Discipline: A specific body of teachable knowledge with its own key concepts and generalizations, methods of inquiry, and special interests (Jarolimek and Parker, 1993).

Interdisciplinary: An approach to knowledge and the curriculum that purposefully draws together knowledge, perspectives, and methods of inquiry from more than one discipline in order to examine a central theme, problem, person, or event (Jarolimek and Parker, 1993).

Ecological literacy: Includes a variety of knowledge, thinking, and values dimensions primarily focused on environmental preservation and restoration (Orr 1992).

Sustainability literacy: The ability and disposition to engage in thinking, problem solving, decision making, and actions associated with achieving sustainability, which include stewardship, respect for limits, interdependence, economic restructuring, fair distribution, intergenerational perspective, and nature as model and teacher (Edwards 2006).

Central place theory: A theory proposed by Walter Christaler that explains how and where central places in the urban hierarchy would be functionally and spatially distributed with respect to one another.

Locational theory: A logical attempt to explain the locational pattern of an economic activity and the manner in which its producing areas are interrelated.

From Human Geography, Culture Society and Space: H. J. De Blij and Alexander B. Murphy. Wiley 2003

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Links

National Geography Standards Grades 9-12: http://www.nationalgeographic.com/xpeditions/standards/matrix.html

National Council for the Social Studies (NCSS):
http://www.socialstudies.org/standards/curriculum