



Pieces of Learning

Pieces of Learning
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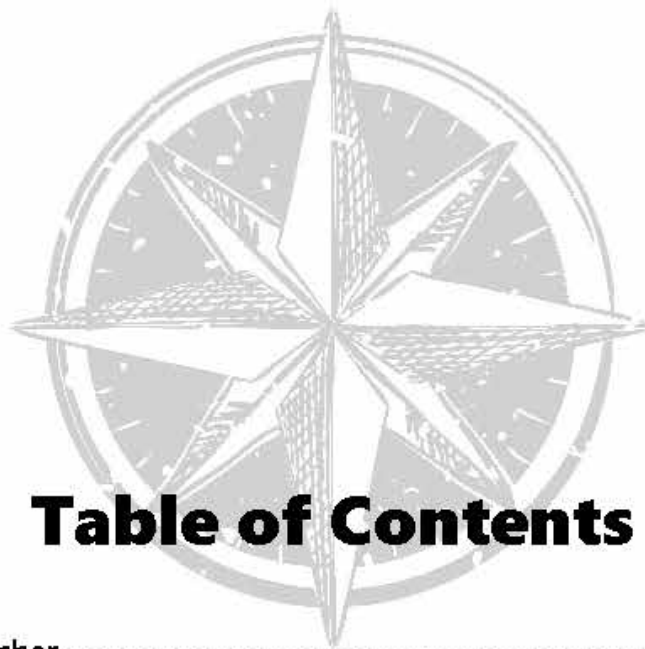


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Introduction to *Explorations in Science*

Dear Teachers,

As former classroom and gifted education resource teachers, we know how challenging it can be to meet the varied needs of your students. In today's one-size-fits-all world, we congratulate you on your efforts to seek out and use materials to offer increased rigor to your students.

Explorations in Science is designed for gifted and high ability students who would benefit from greater challenge in the classroom. While most of your class is involved with regular classroom instruction on grade-level standards, *Explorations in Science* provides the opportunity for some students to work independently on advanced, interdisciplinary investigations into the topics addressed in the Next Generation Science Standards.

You may already have decided which students will benefit from *Explorations in Science* based on your knowledge of your students. If you have not, here are some suggestions:

1. Find or design a suitable pre-assessment when you begin a new unit of study. Knowing which students already understand the big ideas of the unit will help you to identify students who need more rigor in their studies. Don't expect perfection, but do look for outliers.
2. Remember that some students may not demonstrate understanding on a pre-assessment because they are unfamiliar with the topic; however, they may learn the new material rapidly and need a challenging alternative to keep them engaged.
3. Don't rule students out because of behavior problems. Remember that some of those behaviors may be the result of a lack of engagement with the grade-level materials.



We recommend the following in order make the most effective use of these materials:

1. Set up an area that supports students' efforts to work independently. This area should have writing and drawing paper, access to dictionary and thesaurus resources (digital or print), calculator, ruler, scissors, glue, markers, pens and pencils, etc. If you are able to gather some general resources on the Exploration topic in advance, just to get them started, that would be helpful.



2. In all activities students are asked to do some reading and research. Use your professional judgment as to whether a computer should be independently accessible.
3. Students working on *Explorations in Science* can do so without disrupting the class. For example, if you are reviewing material some students have mastered, they can be working on an Exploration.
4. Research shows that extensions that build on classroom learning or address a student passion area have the most impact.

We have intentionally used somewhat sophisticated vocabulary because so many published materials have been oversimplified. However, feel free to adapt these materials to make them accessible, particularly for your second language learners.





Exploration Research Log

Name _____ Title of Exploration _____

You can learn information about a topic by using many resources. Use as many resources as you need to thoroughly research your topic. Write down all the materials you use.

Title of source	Author	Type of source ¹

¹ Types of sources

- Book (fiction or non-fiction)
- Manuscript
- Photograph
- Encyclopedia
- Personal visit (i.e. to a museum, etc.)
- Article (magazine, newspaper, etc.)

- Video
- Website
- Recording (audio or visual)
- Interview
- Historical Fiction
- Journal, letter, diary



Exploration Evaluation Rubric

Name _____ Title of Exploration _____

	Advanced In addition to the criteria listed under "Satisfactory"	Satisfactory	Needs Improvement
Research	___ Student's research was thorough and deep. ___ Student used at least 3 different kinds of resources. ___ Notes were complete and sources were cited.	___ Student used at least 3 different resources. ___ Student took notes in an organized way that enabled him/her to use the information in his/her final product. ___ Student understood the vocabulary used in this area of study.	___ Research was insufficient or the resources chosen were not a good match for the topic. ___ Research was not appropriate to the project chosen. ___ Note-taking was incomplete or missing.
Final product: Content	___ Student is able to respond to Important Questions in his/her area of investigation. ___ Student added his/her own ideas to the project/product. ___ Project demonstrated creativity. ___ Project was unique.	___ Student project based on interest. ___ Student completed all elements of guidelines and checked in with teacher as required. ___ Project reflected student's own thinking/learning. ___ Evidence of research was present in the final product.	___ Project is late or incomplete. ___ Project does not show evidence of research. ___ Project does not show evidence of student thinking/learning.
Final product: Writing	___ Writing demonstrated depth and complexity of thought. ___ Writing used sophisticated vocabulary appropriately.	___ All writing was original work. ___ Writing was well-organized and coherent. ___ Writing was obviously proofread and edited for errors in grammar, spelling and punctuation.	___ Writing lacked clarity or focus.
Presentation of project	___ Project is attractive and polished.	___ Project is organized and easy to understand.	___ Project is disorganized and difficult to understand.
Habits of Learning	___ Student was diligent in his/her learning. ___ Student showed initiative in pursuing new information.	___ Learning/Research Log was completed. ___ Progress on the project was steady and timely. ___ Student worked well independently.	___ Learning/Research Log was incomplete ___ Work was completed hastily or at the last minute. ___ Student had difficulty working independently.

Comments:



Blizzards, Deluges and Heat Waves

Weather Around the World



Focus!

The focus of this Exploration is to understand the factors that influence the weather and climate of different regions. You will also analyze how the weather and climate of a place affect the people who live there.

Important Questions

These questions will guide your exploration...

- ❓ *What factors influence weather? What factors influence climate? In what ways are they similar or different?*
- ❓ *What patterns do you notice as you observe weather/climate patterns in different parts of the world?*
- ❓ *In what ways do people need to adapt to challenges presented by the weather/climate of a region?*
- ❓ *What might be some reasons that people choose to live in regions with very challenging weather and climate conditions?*
- ❓ *How might people be affected by a change in weather/climate patterns over time?*

Project Options

Choose one of the following projects to share your Exploration...

—	Create a new superhero whose power can change the outcome of a damaging weather event. Write a story or a graphic novel in which your hero saves the day using his or her super power. For instance, say the new hero's power is the ability to change the barometric pressure. How would s/he use barometric pressure to "save the day." Be sure the power has a realistic effect.
—	There is a saying that "Everyone complains about the weather, but nobody does anything about it." Is that true? Find out what efforts are being made in each of your four regions to reduce the impact of damaging weather events. Choose two areas and create an illustrated presentation that highlights the damage each area <u>might</u> experience and how they are planning to address it.

More Project Options on the next page...

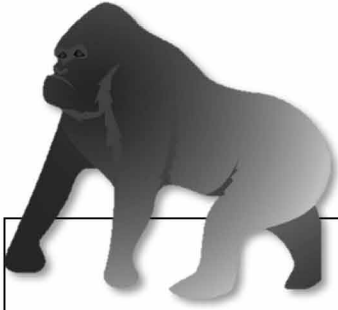
Earth Science Exploration

—	Research the real weather disasters of the Blizzard of 1880-1881 (<i>The Long Winter</i>) or the Grasshopper Plague/Drought of 1877 (<i>Little House on Plum Creek</i> .) Write a script for a newscast in which you explain the event and the meteorology that created the event. If you can, present your newscast on camera.
—	Write one descriptive paragraph about each season, using the writing in the “Little House” book as a guide. Like Laura Ingalls Wilder, describe the beauty of each season, including the sights, sounds, feel, smells and tastes. Your writing should make your readers experience each season using all their senses.
—	Design your own project and get approval from your teacher.

Steps to Success

To complete this Exploration, you will need to do the following...

—	<p>1. Choose a “Little House” book to read. Your focus will be on how the seasons and weather events influence the lives of the Ingalls family.</p> <p>As you read, write in your journal. Note the season at the beginning of the book. Write down information about weather, the plants and animals, available food, work to be done, activities for children, and the joys and hardships the season brings. As the book moves through the year, continue to write down this information for each changing season.</p> <p>In every book, a difficult weather event or natural disaster takes place. Pay special attention to these events and note information about them in your journal.</p> <p><i>Check in with your teacher at this point. Teacher Initials _____</i></p>
—	<p>2. Think carefully about the Important Questions and write your responses to at least three of them in your journal. You will need to include your thinking about these in your final project.</p> <p><i>Check in with your teacher at this point. Teacher Initials _____</i></p>
—	<p>3. Before you begin putting your project together, read the Evaluation Rubric carefully so that you will understand the expectations for success.</p>
—	<p>4. Create your final project. Your project should show your best writing, thinking, and presentation skills.</p> <p><i>Turn in your project and find out what your teacher wants you to do next.</i></p>



Take Action!

Animal Needs and Welfare

Focus!

This Exploration will have you read the novel *The One and Only Ivan* by Katherine Applegate. In this story, Ivan, a wise gorilla who has lived for years in a run-down circus-themed shopping mall, meets Ruby, a baby elephant who is new to the mall. Ivan decides he must find her a better life.

Important Questions

These questions will guide your Exploration...

- ❓ *What was the author's message? How does the author use fiction to make her point?*
- ❓ *What are the current trends in caring for animals in zoos or other exhibits such as Sea World?*
- ❓ *What issues should we consider when deciding whether it is ethical to keep animals in captivity in zoos or other exhibits?*
- ❓ *How has the care of animals in zoos/exhibits changed over time?*
- ❓ *What unanswered questions do you still have about the needs and care of exotic animals?*

Project Options

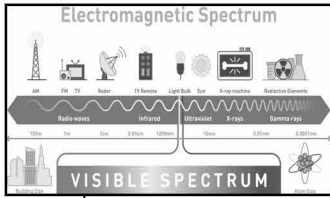
Choose one of the following projects to share your Exploration...

___	Develop a thoughtful newspaper article or letter to the editor in which you take and support a position on why the efforts of a specific animal rescue organization are worthy of support.
___	Plan and execute a fund-raising event for an organization that you feel deserves your support. Be sure you have adult support both at home and at school for this project BEFORE you begin. As part of your fund-raising project, you will need to write a speech or an essay that describes the problem and how this organization will help to solve the problem.
___	Research other animal abuse problems. Write a story about an animal in trouble that gets the reader involved in understanding the problem as you see it.
___	Design your own project and get approval from your teacher.

Steps to Success

To complete this Exploration, you will need to do the following...

—	<p>1. Choose a historical person who has made an impact on the environment. Do some quick research on at least four of the people listed below to see who is interesting to you. Some famous environmentalists include:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Edward Abbey</td> <td style="width: 33%;">Al Gore</td> <td style="width: 33%;">Chico Mendes</td> </tr> <tr> <td>Ansel Adams</td> <td>Temple Grandin</td> <td>Enos Mills</td> </tr> <tr> <td>John James Audubon</td> <td>Julia Hill</td> <td>John Muir</td> </tr> <tr> <td>Eric Brockovich</td> <td>Steve Irwin</td> <td>Mardy Murie</td> </tr> <tr> <td>Rachel Carson</td> <td>Lisa Jackson</td> <td>Richard Nixon</td> </tr> <tr> <td>Jacques Cousteau</td> <td>Aldo Leopold</td> <td>Gifford Pinchot</td> </tr> <tr> <td>Marjory Stoneman Douglas</td> <td>Winona LaDuke</td> <td>Pope Francis</td> </tr> <tr> <td>Dian Fossey</td> <td>Wangari Maathai</td> <td>Theodore Roosevelt</td> </tr> <tr> <td>Lois Gibbs</td> <td>Robert Marshall</td> <td>Vandana Shiva</td> </tr> <tr> <td>Jane Goodall</td> <td>Bill McKibben</td> <td>Henry David Thoreau and others...</td> </tr> </table> <p>Choose the person you will study for your "One Person <u>Can</u> Make a Difference" Exploration.</p> <p><i>Check in with your teacher at this point. Teacher Initials _____</i></p>	Edward Abbey	Al Gore	Chico Mendes	Ansel Adams	Temple Grandin	Enos Mills	John James Audubon	Julia Hill	John Muir	Eric Brockovich	Steve Irwin	Mardy Murie	Rachel Carson	Lisa Jackson	Richard Nixon	Jacques Cousteau	Aldo Leopold	Gifford Pinchot	Marjory Stoneman Douglas	Winona LaDuke	Pope Francis	Dian Fossey	Wangari Maathai	Theodore Roosevelt	Lois Gibbs	Robert Marshall	Vandana Shiva	Jane Goodall	Bill McKibben	Henry David Thoreau and others...
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Eric Brockovich	Steve Irwin	Mardy Murie																													
Rachel Carson	Lisa Jackson	Richard Nixon																													
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Lois Gibbs	Robert Marshall	Vandana Shiva																													
Jane Goodall	Bill McKibben	Henry David Thoreau and others...																													
—	<p>2. Study the life of the person through a variety of resources. Try to find a biography (or an autobiography) of the person, read about their life in encyclopedias or print articles or locate a video about them. See if you can locate information your person wrote about their important issues. Write down every resource you use on your Research Log. Take notes on the information you find in your journal. Answer the following questions:</p> <ul style="list-style-type: none"> • What major events affected your person's life? • What specific contributions did your person make? • What personality traits helped your person achieve success and or fame? • What obstacles did your person have to overcome in his/her life? 																														
—	<p>3. Use your research to develop responses to at least three of the Important Questions. Write down your thoughts in your journal. You will need to include your thinking about these questions in your final project.</p> <p><i>Check in with your teacher at this point. Teacher Initials _____</i></p>																														
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Waves Beyond the Ocean

Electromagnetism with a Creative Eye

Focus!

The focus of this Exploration is to learn about the electromagnetic waves that are responsible for much of what we see and hear. Although we don't notice them, electromagnetic waves are everywhere.

Important Questions

These questions will guide your Exploration...

- ? What vocabulary is specific to the study of this topic? Be sure you can define and use the words.
- ? What are the patterns that differentiate the different kinds of waves?
- ? How has our understanding of electromagnetic waves changed over time?
- ? How might different kinds of scientists and other thinkers use different kinds of waves?
- ? What are some of the issues or controversies that affect our use of electromagnetic waves?
- ? What is one big understanding you have gained about waves?

Project Options

Choose one of the following projects to share your Exploration...

—	Visual Arts: Create a series of illustrations with captions that show how light waves enable us to see colors.
—	Drama: Write a short skit/play that explains to the audience how our understanding and use of electromagnetic waves developed over time. Learn about the history of electromagnetic discovery and incorporate it into your presentation.
—	Music: Use a series of 7 songs – or seven verses for one song – to explain each kind of electromagnetic wave: radio, microwave, infrared, visible light, ultraviolet, x-rays, and gamma rays. You may re-use melodies from songs you know, or you may write new melodies, but your lyrics must be original, meaningful and include factual information. You may perform or record your songs for your audience.

More options on the next page...

Steps to Success

To complete this Exploration, you will need to do the following...

—	<p>1. Choose at least five physical science careers to learn about. Some careers include:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; padding: 5px;"> Aerospace Architect Auto Mechanics Astronomer Audio/Video Technician Biochemist Chemist Electrician </td> <td style="width: 33%; padding: 5px;"> Environmental Engineer Film/Video Editor Food Technician Forensic Scientist Health and Safety Inspector Hydrologist Mechanical Engineer </td> <td style="width: 33%; padding: 5px;"> Medical Researcher Physicist Pilot Robotics Engineer Sound Engineer Teacher/College Professor and more... </td> </tr> </table>	Aerospace Architect Auto Mechanics Astronomer Audio/Video Technician Biochemist Chemist Electrician	Environmental Engineer Film/Video Editor Food Technician Forensic Scientist Health and Safety Inspector Hydrologist Mechanical Engineer	Medical Researcher Physicist Pilot Robotics Engineer Sound Engineer Teacher/College Professor and more...
Aerospace Architect Auto Mechanics Astronomer Audio/Video Technician Biochemist Chemist Electrician	Environmental Engineer Film/Video Editor Food Technician Forensic Scientist Health and Safety Inspector Hydrologist Mechanical Engineer	Medical Researcher Physicist Pilot Robotics Engineer Sound Engineer Teacher/College Professor and more...		
—	<p>2. Do research about each career. Keep notes in your journal about what you learn. Make a list of all the places you get information. Gather information about:</p> <ul style="list-style-type: none"> • What does a person in this job do in general? • What does the person do on a daily basis? • What education is required for the job? • What subjects should you study in high school to prepare for the job or further education? • What is the salary range? • What other information can you find? <p>Reflect on this information and list qualities you think a person needs to have to be successful in this job. (like: "attention to detail," "patience," "quick thinking," or "likes to work alone.") On your list, circle the qualities you believe you have and note if this is a career you would like to possibly pursue when you get older.</p> <p><i>Check in with your teacher at this point. Teacher Initials _____</i></p>			
—	<p>3. Use your research to develop responses to at least three of the Important Questions. Write down your thoughts in your journal. You will need to include your thinking about these questions in your final project.</p> <p><i>Check in with your teacher at this point. Teacher Initials _____</i></p>			
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