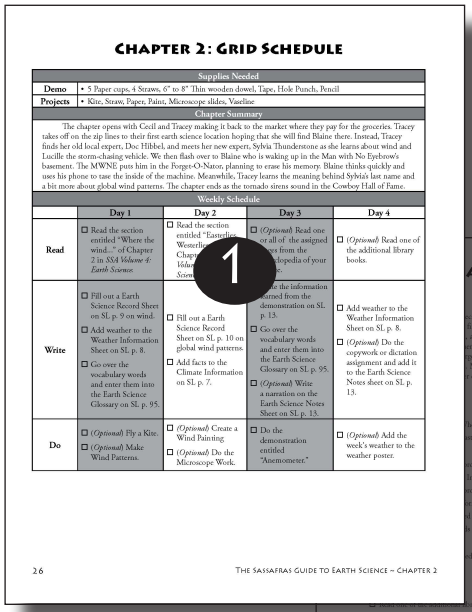
Activity Guide At-a-Glance

Take an adventure-filled journey to learn about science!

1. & 2. Scheduling Options

Choose from a grid-style schedule (1) or a list-style schedule (2). Either way, these scheduling options will make planning your weekly science adventure a snap! These schedule sheets include a summary of the chapter in case your students are reading the novel or listening to the audiobook on their own.



Chapter 2: Grid Schedule

Supplies Needed	
Demo	• 5 Paper cups, 4 Straws, 6" to 8" Thin wooden dowel, Tape, Hole Punch, Pencil
Projects	• Kite, Straw, Paper, Paint, Microscope slides, Vaseline

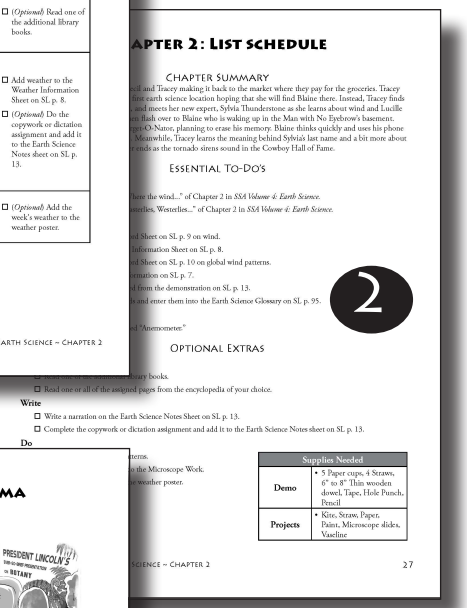
Chapter Summary

The chapter opens with Cecil and Tracey making it back to the market where they pay for the groceries. Tracey takes off on the zip lines to their first earth science location hoping that she will find Blaine there. Instead, Tracey finds her old local expert, Doc Hibbel, and meets her new expert, Sylvia Thunderstone as she learns about wind and Lucille the storm-chasing vehicle. We then flash over to Blaine who is waking up in the Man with No Eyebrow's basement. The MWNE puts him in the Forget-O-Nator, planning to erase his memory. Blaine thinks quickly and uses his phone to tase the inside of the machine. Meanwhile, Tracey learns the meaning behind Sylvia's last name and a bit more about global wind patterns. The chapter ends as the tornado sirens sound in the Cowboy Hall of Fame.

Weekly Schedule

	Day 1	Day 2	Day 3	Day 4
Read	☐ Read the section entitled "Where the wind..." of Chapter 2 in *SSA Volume 4: Earth Science.*	☐ Read the section entitled "Easterlies, Westerlies..." of Chapter 2 in *SSA Volume 4: Earth Science.*	☐ *(Optional)* Read one or all of the assigned pages from the encyclopedia of your choice.	☐ *(Optional)* Read one of the additional library books.
Write	☐ Fill out a Earth Science Record Sheet on SL p. 9 on wind. ☐ Add weather to the Weather Information Sheet on SL p. 8. ☐ Go over the vocabulary words and enter them into the Earth Science Glossary on SL p. 95.	☐ Fill out a Earth Science Record Sheet on SL p. 10 on global wind patterns. ☐ Add facts to the Climate Information on SL p. 7.	☐ Add the information learned from the demonstration on SL p. 13. ☐ Go over the vocabulary words and enter them into the Earth Science Glossary on SL p. 95. ☐ *(Optional)* Write a narration on the Earth Science Notes Sheet on SL p. 13.	☐ Add weather to the Weather Information Sheet on SL p. 8. ☐ *(Optional)* Do the copywork or dictation assignment and add it to the Earth Science Notes sheet on SL p. 13.
Do	☐ *(Optional)* Fly a Kite. ☐ *(Optional)* Make Wind Patterns.	☐ *(Optional)* Create a Wind Painting ☐ *(Optional)* Do the Microscope Work.	☐ Do the demonstration entitled "Anemometer."	☐ *(Optional)* Add the week's weather to the weather poster.

1



Chapter 2: List Schedule

Chapter Summary

...and Tracey making it back to the market where they pay for the groceries. Tracey ...first earth science location hoping that she will find Blaine there. Instead, Tracey finds ...and meets her new expert, Sylvia Thunderstone as she learns about wind and Lucille ...an flash over to Blaine who is waking up in the Man with No Eyebrow's basement. ...h-O-Nator, planning to erase his memory. Blaine thinks quickly and uses his phone ...Meanwhile, Tracey learns the meaning behind Sylvia's last name and a bit more about ...winds as the tornado sirens sound in the Cowboy Hall of Fame.

Essential To-Do's

...here the wind..." of Chapter 2 in *SSA Volume 4: Earth Science.*

...Easterlies, Westerlies..." of Chapter 2 in *SSA Volume 4: Earth Science.*

...ord Sheet on SL p. 9 on wind.

...Information Sheet on SL p. 8.

...ord Sheet on SL p. 10 on global wind patterns.

...rmation on SL p. 7.

...d from the demonstration on SL p. 13.

...and enter them into the Earth Science Glossary on SL p. 95.

...ed "Anemometer."

Optional Extras

...ary books.

☐ Read one or all of the assigned pages from the encyclopedia of your choice.

Write

☐ Write a narration on the Earth Science Notes Sheet on SL p. 13.

☐ Complete the copywork or dictation assignment and add it to the Earth Science Notes sheet on SL p. 13.

Do

...terns.

...the Microscope Work.

...weather poster.

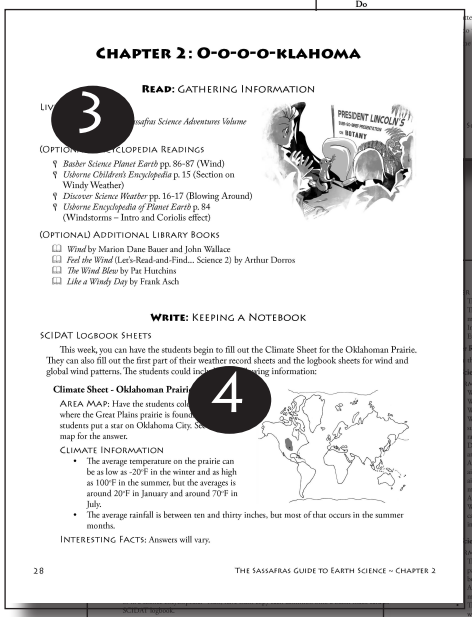
Supplies Needed	
Demo	• 5 Paper cups, 4 Straws, 6" to 8" Thin wooden dowel, Tape, Hole Punch, Pencil
Projects	• Kite, Straw, Paper, Paint, Microscope slides, Vaseline

2

Read

3. Reading Assignments

Know what to read each week in the corresponding Sassafras Science novel. Plus, get options for additional encyclopedia pages to read and for books to check out from the library. The novel contains the essential information for each week, but if you want to dig deeper, we've got you covered!



Chapter 2: O-O-O-O-Klahoma

Read: Gathering Information

Liv... ...*safras Science Adventures Volume*

(Optional) Encyclopedia Readings

- *Basher Science Planet Earth* pp. 86-87 (Wind)
- *Usborne Children's Encyclopedia* p. 15 (Section on Windy Weather)
- *Discover Science Weather* pp. 16-17 (Blowing Around)
- *Usborne Encyclopedia of Planet Earth* p. 84 (Windstorms – Intro and Coriolis effect)

(Optional) Additional Library Books

- *Wind* by Marion Dane Bauer and John Wallace
- *Feel the Wind* (Let's-Read-and-Find... Science 2) by Arthur Dorros
- *The Wind Blew* by Pat Hutchins
- *Like a Windy Day* by Frank Asch

Write: Keeping a Notebook

SCIDAT Logbook Sheets

This week, you can have the students begin to fill out the Climate Sheet for the Oklahoman Prairie. They can also fill out the first part of their weather record sheets and the logbook sheets for wind and global wind patterns. The students could incl... ...esting information:

Climate Sheet - Oklahoman Prairie

Area Map: Have the students col... ...where the Great Plains prairie is found... ...students put a star on Oklahoma City. St... ...map for the answer.

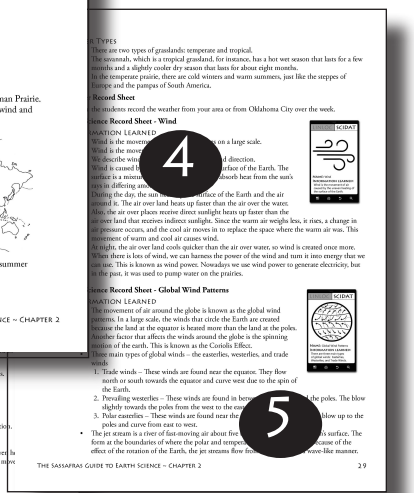
Climate Information

- The average temperature on the prairie can be as low as -20°F in the winter and as high as 100°F in the summer, but the averages is around 20°F in January and around 70°F in July.
- The average rainfall is between ten and thirty inches, but most of that occurs in the summer months.

Interesting Facts: Answers will vary.

3

4



...Types

...There are two types of grasslands: temperate and tropical. ...savannah, which is a tropical grassland, for instance, has a hot wet season that lasts for a few ...months and a slightly cooler dry season that lasts for about eight months. ...the temperate prairie, there are cold winters and warm summers, just like the steppes of ...Europe and the pampas of South America.

...Record Sheet

...the students record the weather from your area or from Oklahoma City over the week.

...ience Record Sheet - Wind

...MATION LEARNED

...Wind is the move... ...on a large scale. ...We describe wind... ...d direction. ...Wind is caused b... ...rface of the Earth. The ...surface is a minim... ...absorb heat from the sun's ...rays in differing am... ...During the day, the sun... ...rface of the Earth and the air ...around it. The air over land heats up faster than the air over the water, ...than the air over places receive direct sunlight heats up faster than the ...air over land that receives indirect sunlight. Since the warm air weighs less, it rises, a change in ...air pressure occurs, and the cool air moves in to replace the space where the warm air was. This ...movement of warm and cool air causes wind. ...At night, the air over land cools quicker than the air over water, so wind is created once more. ...When there is lots of wind, we can harness the power of the wind and turn it into energy that we ...can use. This is known as wind power. Nowadays we use wind power to generate electricity, but ...in the past, it was used to pump water on the prairies.

...ience Record Sheet - Global Wind Patterns

...MATION LEARNED

...The movement of air around the globe is known as the global wind ...patterns. In a large scale, the winds that circle the Earth are created ...because the land at the equator is heated more than the land at the poles. ...Another factor that affects the winds around the globe is the spinning ...motion of the earth. This is known as the Coriolis Effect.

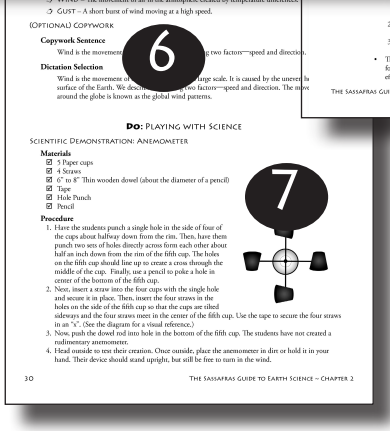
...Three main types of global winds – the easterlies, westerlies, and trade ...winds

1. Trade winds – These winds are found near the equator. They flow north or south towards the equator and curve west due to the spin of the Earth.
2. Prevailing westerlies – These winds are found in ... ...the poles. The blow slightly towards the poles from the west to the ea...
3. Polar easterlies – These winds are found near the ... ...blow up to the poles and curve from east to west.

- The jet stream is a river of fast-moving air about five ... ...'s surface. The form at the boundaries of where the polar and tempera... ...cause of the effect of the rotation of the Earth, the jet streams flow from ... ...wave-like manner.

4

5



...SCIDAT logbook.

- Wind – The movement of air in the atmosphere created by temperature differences.
- Gust – A short burst of wind moving at a high speed.

(Optional) Copywork

Copywork Sentence

Wind is the movem... ...g two factors—speed and direction.

Dictation Selection

Wind is the movement of ... ...large scale. It is caused by the unevenness of the surface of the Earth. We describe ... ...two factors—speed and direction. The move... around the globe is known as the global wind patterns.

6

Do: Playing with Science

Scientific Demonstration: Anemometer

Materials

- ☑ 5 Paper cups
- ☑ 4 Straws
- ☑ 6" to 8" Thin wooden dowel (about the diameter of a pencil)
- ☑ Tape
- ☑ Hole Punch
- ☑ Pencil

Procedure

1. Have the students punch a single hole in the side of four of the cups about halfway down from the rim. Then, have them punch two sets of holes directly across form each other about half an inch down from the rim of the fifth cup. The holes on the fifth cup should line up to create a cross through the middle of the cup. Finally, use a pencil to poke a hole in center of the bottom of the fifth cup.
2. Next, insert a straw into the four cups with the single hole and secure it in place. Then, insert the four straws in the holes on the side of the fifth cup so that the cups are sited sideways and the four straws meet in the center of the fifth cup. Use the tape to secure the four straws in an "x". (See the diagram for a visual reference.)
3. Now, push the dowel rod into hole in the bottom of the fifth cup. The students have not created a rudimentary anemometer.
4. Head outside to test their creation. Once outside, place the anemometer in dirt or hold it in your hand. Their device should stand upright, but still be free to turn in the wind.

7

Write

4. SCIDAT Logbook Info

Have confidence that your students are grasping the key points from the reading with the information in the notebooking section. Here, you will find the scientific details that were shared in the chapter, which could be included in your students' narrations or list of facts.

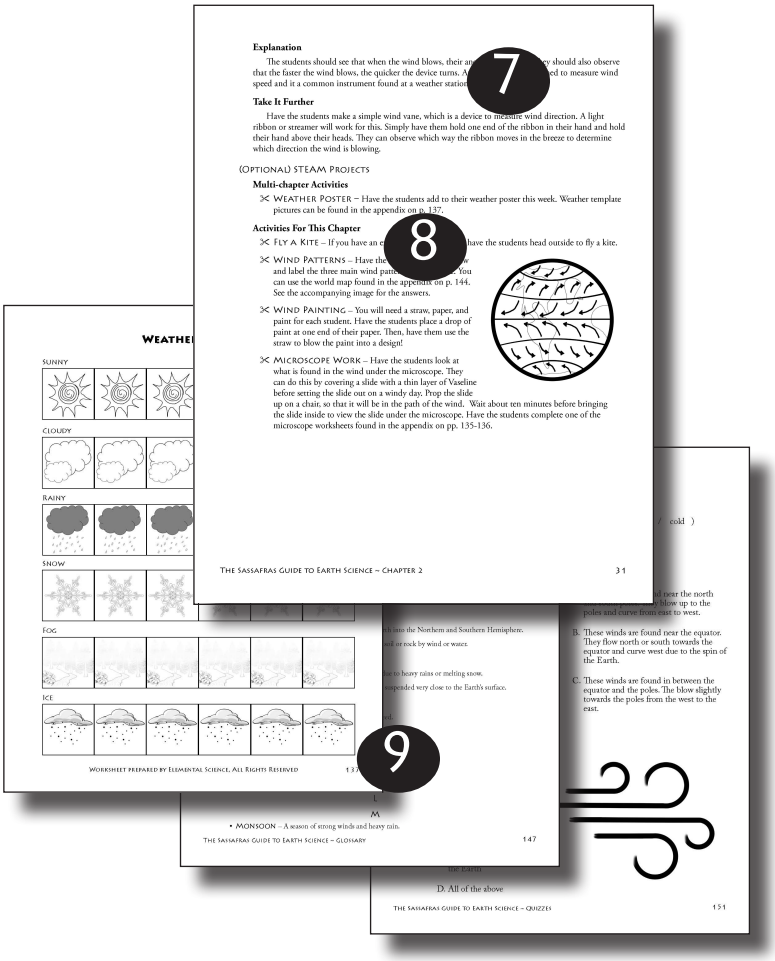
5. Relevant Vocabulary

Build your students' science vocabulary with words relevant to the topics the students are studying.

6. Copywork

Use these selections as memory work, copywork, or dictation—it's up to you!

Activity Guide At-a-Glance



DO

7. Related Scientific Demonstrations

Know what materials you will need to do a weekly hands-on science activity that coordinates with the topic. This section lists the supplies you will need, provides easy-to-follow steps, and explanations to make it a snap to complete the scientific demonstration.

8. Coordinating STEAM* Activities

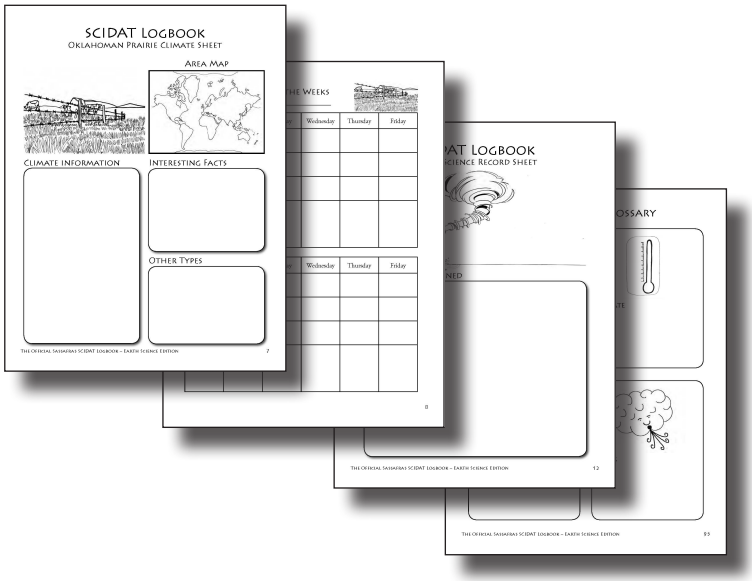
Add in a bit of STEAM with these optional activity ideas. You will find ideas for projects that last throughout the novel and ones specific to the chapter (week) you are on.

9. Templates and More

In the guide's appendix, you will find templates for the projects, a full glossary, and a set of quizzes to use along the journey.

*STEAM: Science, Technology, Engineering, Art, and Math)

The SCIDAT Logbook



Don't forget the SCIDAT logbook for your students!!

The SCIDAT logbook will serve as a record of your students' journey! It contains all the pages the students will need as they follow like Blaine and Tracey. Each page has been attractively illustrated for you so you don't have to track down pictures for the students to use! Get it all at:

https://elementalscience.com/collections/sassafras-science

*SCIDAT: Scientific Data

THIS PRODUCT IS INTENDED FOR HOME USE ONLY

The Sassafras Guide to Earth Science

Second Edition, First Printing

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Quick Start Guide

Welcome to your super, scientific journey with the Sassafras Twins!! The information and activities in this guide will help you turn a simple adventure novel into a complete science program for your elementary students. Let's start by answering three pressing questions!

What Will We Learn?

Students will learn about earth science, which is the study of our planet. See p. 11 for a list of the topics explored in this program.

What Do I Need?

In addition to this activity guide, you will need the following materials:

1. **Novel –** *The Sassafras Science Adventures Volume 4: Earth Science* - All the main reading assignments are from this book. You can get the paperback novel, the Kindle version, or the audiobook.

2. **Student Materials –** You can have your students use a blank notebook or you can purchase a copy of *The Official Sassafras SCIDAT Logbook: Earth Science Edition* for each student. Get a glimpse of this option on p. 7. (SCIDAT stands for scientific data and it comes from the Sassafras Twins' journey.)

3. **Demonstration Supplies –** See p. 12 for a full list, or save yourself time and get the *Sassafras Science Year 2 Experiment Kit*, which includes the materials for both volume 3 and volume 4.

If you want more information than what is already in the novel, the following encyclopedias are scheduled in this guide:

- *Basher Science Planet Earth* (best for 1st through 2nd grades as a read aloud)
- *Usborne Children's Encyclopedia* (best for 2nd through 4th grades)
- *Discover Science Weather* (best for 2nd through 4th grades)
- *Usborne Encyclopedia of Planet Earth* (best for grades 4th through 6th grades)

If you want to add more fun with optional STEAM* projects, you can find a list of the project supplies on p. 13.

*STEAM: Science, Technology, Engineering, Art, and Math

What Will a Week Look Like?

Each week you and your students will:

- **Read** scientific information from an adventure-filled novel, also known as a living book, and discuss what you read.

- **Write** down what the students have learned and seen in a way that is appropriate for their skills by keeping a notebook, or rather a SCIDAT Logbook.

- **Do** hands-on science through demonstrations using the directions found in this guide.

You can also add in the optional copywork, library books, and STEAM projects if you want to dig deeper into a topic. For a more detailed explanation of the components in each lesson, we highly recommend checking out the peek inside this guide on pp. 6-7 and reading the introduction on pp. 8-10. The chapter lessons begin on p. 19.

THE SASSAFRAS SCIENCE ADVENTURES

The Sassafras Guide to Earth Science
Table of Contents

The Sassafras Guide to Earth Science Introduction

Our living books method of science instruction was first proposed in *Success in Science: A Manual for Excellence in Science Education*. This approach is centered on living books that are augmented by notebooking and scientific demonstrations. The students read (or are read to) from a science-oriented living book, such as *The Sassafras Science Adventures Volume 4: Earth Science*. Then, they write about what they have learned and complete a related scientific demonstration or hands-on project. If time and interest allow, the teacher can add in non-fiction books that coordinate with the topic, do an additional activity, or memorize related information. If you want to learn more about how this works, you can listen to this free conference session on using living books for science:

- Inspiring your students to love science through living books: https://youtu.be/Dvk1LfYGONw

The books in *The Sassafras Science Adventures* series are designed to give you the tools you need to employ the living books method of science instruction with your elementary students. For this reason, we have written an activity guide and a logbook that corresponds to each novel. This particular activity guide contains 18 chapters of activities, reading assignments, scientific demonstrations, and so much more for studying earth science.

Each of the chapters in this guide corresponds directly to the chapters in *The Sassafras Science Adventures Volume 4: Earth Science*. They were written to give you the information you need to turn the adventure novel into a full science course for your elementary students. They will provide you with a buffet of options you can use to teach the students about our planet. So pick and choose what you know you and your students will enjoy!

What Each Chapter Contains

Each chapter begins with your two scheduling options—a grid schedule and a list schedule. These contain a summary of the corresponding chapter in *The Sassafras Science Adventures Volume 4: Earth Science* and the same weekly assignments, but in a different format. These schedules are included to give you an idea of how your week could be organized, so please feel free to alter them to suit your needs. Following the scheduling options, you will find the details for reading, writing, and doing science for the particular chapter. This information is divided into the following sections:

Read: Gathering Information

- Living Book Reading Assignment – This section contains the corresponding chapter in *The Sassafras Science Adventures Volume 4: Earth Science*.

- (Optional) Encyclopedia Readings – This section contains possible reading assignments from:
  - *Basher Science Planet Earth* (best for 1st through 2nd grades as a read aloud)
  - *Usborne Children's Encyclopedia* (best for 2nd through 4th grades)
  - *Discover Science Weather* (best for 2nd through 4th grades)
  - *Usborne Encyclopedia of Planet Earth* (best for grades 4th through 6th grades)

  You can choose to read them to the students or have the students read them on their own.

📖 (Optional) Additional Library Books – This section contains a list of books that coordinate with what is being studied in the chapter. You can check these books out of your local library.

Write: Keeping a Notebook

📋 SCIDAT Logbook Information – This section has the information that the students could have included in their SCIDAT logbooks. (SCIDAT stands for scientific data and it comes from the Sassafras Twins' journey.) The students may or may not have the same information on their logbook sheets, which is fine. You want their SCIDAT logbooks to be a record of what they have learned. The logbook information is included as a guide for you to use as you check their work. For more information about notebooking, please read the following article:

- What is notebooking? – https://elementalscience.com/blogs/news/what-is-notebooking
- How to use notebooking with different ages – https://elementalscience.com/blogs/news/notebooking-with-different-ages

✍ Vocabulary – This section includes vocabulary words that coordinate with each chapter. If the students are older, we recommend that you have them create a glossary of terms using a blank sheet of lined paper or the glossary sheets provided in *The Official Sassafras Student SCIDAT Logbook: Earth Science Edition*. You can also have them memorize these words and their definitions.

☞ (Optional) Copywork – This section contains a short copywork passage and a longer dictation passage for you to use. Some students may use the shorter passages for dictation or the longer passages for copywork. Feel free to tailor the selections to your students' abilities. You can also use the selections as memory work assignments for the students.

⌛ (Optional) Quiz – This section contains the answers for the quizzes included in the appendix. These simple, short quizzes are optional. You can use them as graded quizzes or as review sheets.

Do: Playing with Science

☑ Scientific Demonstration – This section includes a list of materials, the instructions, and an explanation for a scientific demonstration that coordinates with the chapter. There is a blank lab report sheet provided for you in the appendix on pp. 129-130 if you would like the students to do a write-up of the demonstration. If the students are in grade 4 or higher, we recommend that they complete at least one of these activities for this course.

✂ (Optional) STEAM* Projects – These sections contain additional STEAM projects and activities that correspond to the topics in the chapter. There are multi-chapter activities that students can do over the course of several chapters or over the full novel. Plus, there are activities that coordinate with each specific chapter. Pick and choose the activities that interest you and your students.

*STEAM: Science, Technology, Engineering, Art, and Math

Additional Materials

We have provided a few additional materials in the back of this guide for your convenience. First, you will find the templates you need for the projects suggested in this guide. Next, you will find a glossary of terms, which you can use with the students as they define the words for each chapter. And finally, you will find a set of eight simple quizzes you can use with the students to verify they are retaining the material.

Quick Links

View all the links mentioned in this guide in one place and get a digital copy of the templates, glossary, and quizzes by visiting the following page:

- https://elementalscience.com/blogs/resources/volume-4-links

For the students

The SCIDAT logbook is meant to be a record of the students' journey through their study of earth science. It is explained in more detail in Chapter 1 of this guide. You can choose to make your own or purchase a premade logbook from Elemental Science. *The Official Sassafras SCIDAT Logbook: Earth Science Edition* has all the pages the students will need to create their own logbook. Each page has been attractively illustrated for you so you don't have to track down pictures for the students to use. This way they can focus on the information they are learning.

Final Thoughts

As the author and publisher of this curriculum I encourage you to contact me with any questions or problems that you might have concerning *The Sassafras Guide to Earth Science* at support@elementalscience.com. I, or a member of our team, will be more than happy to assist you. I hope that you and your students enjoy your journey through earth science with the Sassafras twins!

~ Paige Hudson

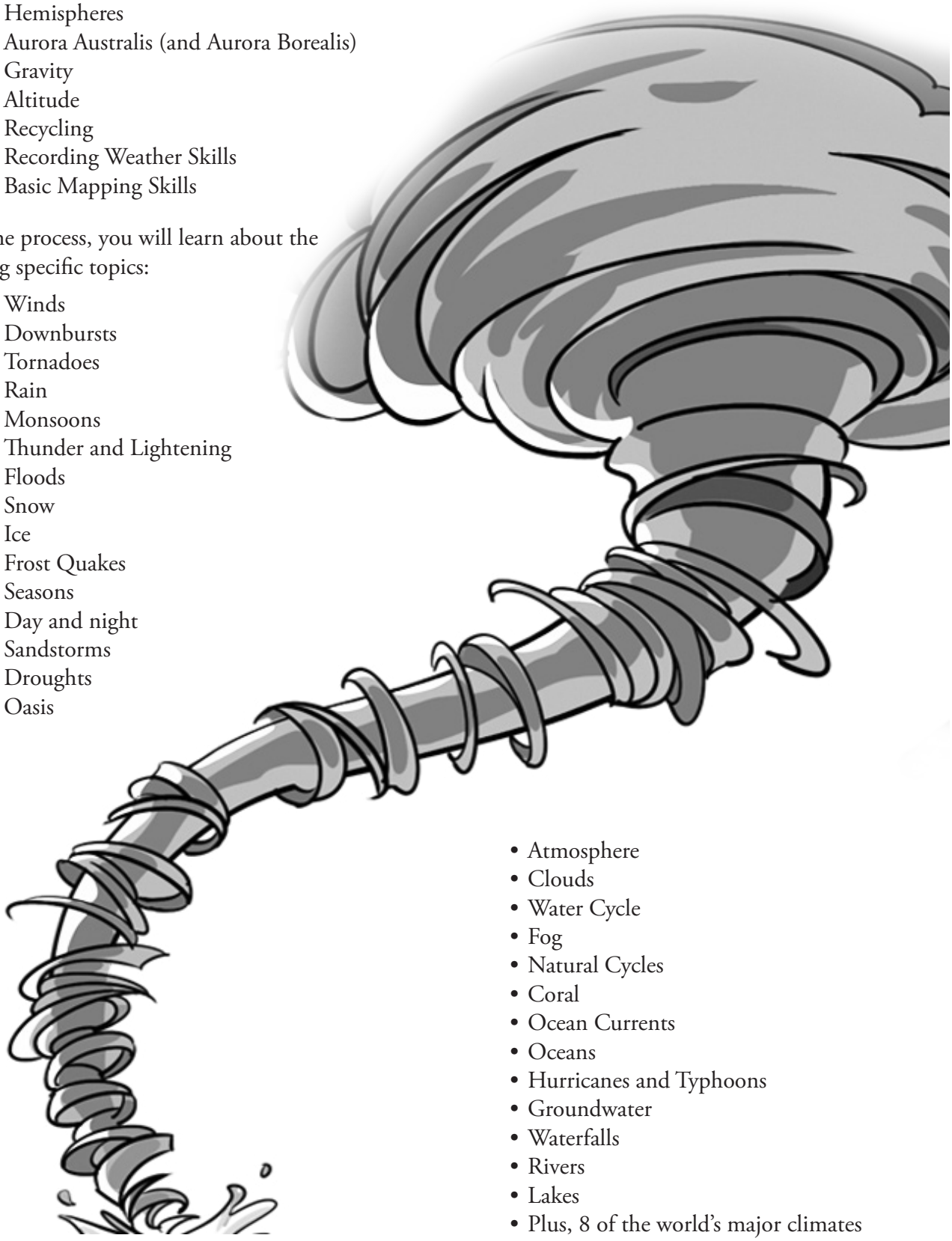
Topical List

The Sassafras Science Adventures Volume 4: Earth Science covers a variety of aspects of earth science, such as:

- Hemispheres
- Aurora Australis (and Aurora Borealis)
- Gravity
- Altitude
- Recycling
- Recording Weather Skills
- Basic Mapping Skills

In the process, you will learn about the following specific topics:

- Winds
- Downbursts
- Tornadoes
- Rain
- Monsoons
- Thunder and Lightening
- Floods
- Snow
- Ice
- Frost Quakes
- Seasons
- Day and night
- Sandstorms
- Droughts
- Oasis



- Atmosphere
- Clouds
- Water Cycle
- Fog
- Natural Cycles
- Coral
- Ocean Currents
- Oceans
- Hurricanes and Typhoons
- Groundwater
- Waterfalls
- Rivers
- Lakes
- Plus, 8 of the world's major climates

Demonstration Supplies Listed By Chapter

Chapter	Supplies Needed
1: Observing the Weather	No supplies needed
2: Anemometer	5 Paper cups, 4 Straws, 6" to 8" Thin wooden dowel (about the diameter of a pencil), Tape, Hole Punch, Pencil
3: Tornado in a Bottle	2 Soda bottles, Duct tape, Water
4: Rain Gauge	Plastic water bottle, Duct tape, Permanent marker, Small marbles or rocks, Ruler
5: Storm in a Glass	Clear glass jar, Jar lid or bowl, Ice cubes, Warm water
6: Snowflakes	Glass Jar, 2 Pipe cleaners, Pencil, Borax (Note—This can be found in the laundry detergent aisle of the grocery store.), Water
7: Expanding Ice	Small paper cup, Water
8: Day or Night	A globe (or large ball), A desk lamp, A Post-it tab (or another type of removable marker)
9: Drought Crust	Dark construction paper (black or brown), Water, Salt
10: Barometer	Clear plastic cup, Soda bottle, Blue food coloring, Water, Marker
11: Cloud in a Bottle	Hot water, Glass jar with lid, Crushed ice, Match
12: Water Cycle in a Bag	Plastic baggie, Warm water, Tape
13: Soil Test	Soil sample, Coffee filter, Rubber band, 2 Cups, Distilled water, Aquarium test strip (one that tests the pH and nitrate levels)
14: Moving currents	Water, Cup, Ice, Bowl, Blue food coloring
15: Ocean Float	2 Eggs, 2 Tall Cups, Water, Salt
16: Groundwater Filter	Plastic bottle, Cotton balls, Gravel, Sand, Soil, Duct tape, Water
17: River Erosion	Flour, Aluminum pan, Eye dropper, Water
18: Atlas Run	Atlas Run Game Cards and Board (Download these for free from Elemental Science.)

STEAM Project Supplies Listed By Chapter

The multi-chapter and specific chapter STEAM projects listed in this guide are optional, so you may not need all of these supplies. However, this list has been provided for your convenience. If you do decide to do these projects, in addition to the items listed each week you will need glue, scissors, a variety of paint colors, and a set of markers.

Chapter	Supplies Needed
1	No supplies needed
2	Kite, Straw, Paper, Paint, Microscope slides, Vaseline
3	Straw, Dirt or dust, Shallow pan
4	Clear glass, Shaving cream, Blue food coloring, Water, Paper, Microscope slides
5	Brown paper bag, Balloon, Fluorescent light bulb
6	Box of cornstarch, Can of shaving cream, Epsom salts, Water, Food coloring, Paper, Microscope slides
7	Air dry clay, Brown pipe cleaners, Felt (green, red, orange, and/or yellow), Clear glass, Crushed ice, Salt
8	Flour, Vegetable oil, Sand, Microscope slides
9	Materials will vary based on how the students choose to represent an oasis
10	White paint, Cotton balls, Blue construction paper
11	Cotton balls, Blue construction paper
12	Dry ice, A shallow container, Water
13	No supplies needed
14	Plastic bottle, Water, Blue food coloring, Oil, Duct tape, Coral sample
15	Corn syrup, Dish soap, Water, Oil, Rubbing alcohol, Black, purple, and blue food coloring, Plastic water bottle, Opaque liquid soap that contains glycol stearate (such as the Softsoap brand), Duct tape
16	Sponge, Bar of soap (like Ivory)
17	Materials will vary based on how the students choose to represent the three stages of a river
18	Magazine Pictures

Microscope Information

In this activity guide I have suggested several dissection and microscope activities. These are optional and they are best utilized with older students. For the microscope work, I have included links to view the slides online, so purchasing a microscope is not absolutely necessary for this course. I have shared the information below about purchasing these supplies for your convenience.

Microscope Information

If you do not already own a microscope and you have the funds to get one, I suggest purchasing one for this course. You can purchase a good quality microscope at:

- Lab Essentials, Inc (www.labessentials.com)
- Children's microscopes (www.childrensmicroscopes.com/022a000m.html)
- Home School Science Tools (www.hometrainingtools.com)

When purchasing a microscope, you are looking for the following things:

- ☑ A compound monocular microscope
- ☑ A microscope with 4x, 10x, and 40x objective lenses at a minimum (NOTE—The eyepiece should also give 10x magnification, which then will allow you to look at an object at 40x, 100x, and 400x magnification.)
- ☑ A microscope with separate coarse and fine adjustment knobs
- ☑ A good light source (NOTE—The best light source is a fluorescent bulb. Do not get one with mirror illumination.)

If you don't know how to use a microscope, see this website for directions:

- http://www.microscope-microscope.org/basic/how-to-use-a-microscope.htm

A Palm-sized option

Many of the microscope assignments in this guide could also been done with a palm-sized microscope. You won't see quite as much as you can with a full-sized microscope, but this a much less expensive option! Here's a look at what a palm-sized microscope can do:

- https://elementalscience.com/blogs/news/palm-sized-microscope-review

If you are not sure which option will work for you, check out the following article for a comparison of the options:

- https://elementalscience.com/blogs/news/which-type-of-microscope-for-homeschool

The Sassafras Guide to the Characters Found in Volume 4: Earth Science

Throughout the Book*

- **Blaine Sassafras –** The male Sassafras twin, also known as Train. So far this summer, he has swung upside down in the trees, fallen out of a heliquickter, and lost his phone multiple times.
- **Tracey Sassafras –** The female Sassafras twin, also known as Blaisey. So far this summer, she has been kidnapped by an Amazonian tribal leader, caught in a rockslide, and trapped inside a box.
- **Cecil Sassafras –** The Sassafras twins' crazy, but talented uncle. He is eccentric and messy, but his brilliant mind co-invented the invisible zip lines and several other contraptions.
- **President Lincoln –** Uncle Cecil's lab assistant, who also happens to be a prairie dog. He doesn't say much, but his talent has been used to create amazing presentations, fix glitches, and co-invent the invisible zip lines.
- **The Man With No Eyebrows –** He has no eyebrows and seems to be trying to sabotage the twins at every stop. He has broken into Cecil's lab and has been spying on Cecil's every move.

(*__Note__—These characters also appeared in the first three volumes of *The Sassafras Science Adventures* series.)

Cecil's Neighborhood (Chapters 1 and 18)

- **Old Man Grusher's Dog –** Also known as the "guardian beast". This miniature poodle loves to chase Cecil Sassafras.
- **Mrs. Pascapali (paz-kah-pah-LEE) –** She is Uncle Cecil's neighbor who lives at 1106 North Pecan Street.
- **Preston –** He is the squeaky and skinny teenaged clerk of the Left-handed Turtle Market.

Oklahoma City (Chapters 2-3)

- **Sylvia Thunderstone –** The twins' local expert for their time in the Oklahoma prairie. She is a native Oklahoman and the meteorologist in charge of Lucille, the storm-chasing vehicle.
- **Sylvester Hibbel (Doc) –** He is a traveling salesman, cowboy enthusiast, and inventor of several medicinal elixirs. The twins first met him during their anatomy leg.
- **Jayman –** He is a friend and colleague of Dr. Thunderstone. He is responsible for relaying weather information from the main station to Lucille.

The Congo (Chapters 4-5)

- **Carver Brighton –** The twins' local expert for their time in the Democratic Republic of the Congo. He is a professor of geochemistry who is serving as the scientific expert for the Giant Bonobo Diamond Treasure Hunt.
- **Garfield T. Wellington the Fourth –** He is the benefactor of the Giant Bonobo Diamond Treasure Hunt.
- **Stuart Dimsley –** He is a long-time rival of Carver Brighton's and a professor of cultural studies. He serves as the cultural expert for the Giant Bonobo Diamond Treasure Hunt.
- **Bakaza (bah-KAH-zah) –** He is the Congolese guide and trailblazer for the Giant Bonobo Diamond Treasure Hunt.
- **Chief Wazabanga(wah-zah-BANG-ah) –** He is the chief of the pygmy warriors that the treasure hunters run into while on their search.

Patagonia (Chapters 6-7)

- **Hawk Talons** – He is the twin's local expert for their Patagonia leg and host of the "Out of the Office" TV show. He is an adventurer, scientist, survivalists, and member of Antarctica's Special Forces.
- **Ted** – He is one of the workers at the Q.B. Cubicles office and is very reluctantly participating in the latest episode of "Out of the Office".
- **Mitchell** – He is also an employee at Q.B. Cubicles that is participating in the latest episode of "Out of the Office". He is excited to be a part of the challenge, but is not the sharpest tool in the shed.
- **Tammy** – She is another one of the workers from Q.B. Cubicles participating in the latest episode of "Out of the Office".
- **Barbara** – She is a bit of a hypochondriac who is also from Q.B. Cubicles participating in the latest episode of "Out of the Office".

Mongolia (Chapters 8-9)

- **Ganzorig (gan-ZOR-ig) Buri** – He is the twin's local expert for their time in the Mongolian Desert. Ganzorig is a college student returning home for his summer break.
- **Solongo (so-LONG-o)** – A close friend of Ganzorig's. She is from the same Buri village as he is.
- **Avargatom (AH-var-gat-um)** – A band of large-statured raiders who travel throughout the Mongolian desert stealing from small villages.
- **Dariin (dar-EEN)** – One of Ganzorigs brothers.
- **Khulan (KOO-lan)** – One of Ganzorigs brothers.

Pakistan (Chapter 10-11)

- **Atif (A-teef) Jilani (JEE-lahn-nee)** – He is the quiet, steady, and knowledgeable local expert for the twin's time in Pakistan. He is known to everyone as the Shepherd.
- **Javeria (ha-ver-EE-ah)** – She is an orphan and one of the Shepherd's apprentices.
- **Aazmi (ahz-MEE)** – He is an orphan and one of the Shepherd's apprentices.
- **Tariq (Tah-REEK)** – He is an orphan and one of the Shepherd's apprentices.
- **Qaiser (KA-zer) Qazi (KA-zee)** – An infamous thief known as the Raider.
- **Naveed (nah-VEED)** – A former student of the Shepherd's.
- **The Magistrate –** A governor in the Karakoroam region of Pakistan; his word is law.

Alaska (Chapter 12-13)

- **Summer Beach** – The loveable, excitable scientist and Alaskan local expert. Blaine and Tracey have gotten to know and love her throughout their adventure.
- **Ulysses S. Grant** – Summer's lab assistant, who happens to be an arctic ground squirrel. He is the inventor of the robot squirrels.

- **Yotimo** – The stoic Alaskan native who saved Tracey from a polar bear during the twin's zoology leg.
- **Skeeter and Tina Romig (ROOM-ig)** – Friends of Summer's who are science teachers that recently moved to Alaska.

The Pacific Ocean (Chapters 14-15)

- **Billfrey Battaballabingo** – The twin's local expert for their time in the Pacific Ocean. He is a marine biologist who has spent far too much time alone on the Western Garbage Patch.
- **Cantankerous Carl** – Billfrey's ladder-man companion.
- **Sticky Fingers Stevie** – Billfrey's coat-rack-man companion.
- **Mr. and Mrs. Osodarling** – The broom and mop couple who keep Billfrey company.
- **Ig** – Billfrey's mannequin companion.
- **Peach Beard** – The not-to-bright captain of the P.R.O. Pirates whom the twins first meant on their zoology leg.

Switzerland (Chapter 16-17)

- **Evan DeBlose –** The Triple S agent who serves as the twin's local expert for their time in Switzerland, a.k.a., Agent Pork.
- **Jorgen Wuthrich –** Triple S agent and DeBlose's partner, a.k.a. Agent Beans.
- **Yuroslav Bogdanovich** – He is the rouge scientist and evil villain who travels around Europe to carry out his evil schemes. The twins first meant him during their botany leg.
- **Adriana Archer –** Triple S agent who is goes by the name Agent Mac. She is partners with Agent Zwyssig.
- **Gottfried Zwyssig (zzz-WHY-zig)** – Triple S agent who is goes by the name Agent Cheese. He is partners with Agent Archer.
- **Captain Marolf** – Head of the Triple S Agency.
- **Q-Tip –** The Triple S's expert in technologizing.

Chapter Lessons

Chapter 1: Grid Schedule

Supplies Needed	
Demo	• No Supplies Needed
Projects	• No Additional Supplies Needed

Chapter Summary

The chapter opens with Blaine, Tracey, and Uncle Cecil making the harrowing journey to the Left-Handed Turtle Market, despite the Guardian Beast, a.k.a., Old Man Grusher's poodle. Cecil forgets his wallet and so the trio has to return home. The chapter flashes over to the Man With No Eyebrows where we learn more about his latest plan to stop the twins—the Forget-O-Nator. Back in the lab, the twins watch President Lincoln's review video from their botany. The twins also learn about the new "TASER" app before heading back to the market with their uncle. One the way back, the Guardian Beast finds the trio, a chase ensues, and Blaine is separated from the other two.

Weekly Schedule

	Day 1	Day 2	Day 3	Day 4
Read	☐ Read the section entitled "Entering the territory..." of Chapter 1 in *SSA Volume 4: Earth Science.*	☐ (*Optional*) Read one or all of the assigned pages from the encyclopedia of your choice.	☐ Read the section entitled "A Photosyntastic Program" of Chapter 1 in *SSA Volume 4: Earth Science.*	☐ (*Optional*) Read one of the additional library books.
Write	☐ Set up the students' SCIDAT logbooks.	☐ Write observations learned from the demonstration on SL p. 5. ☐ (*Optional*) Write a narration on the Earth Science Notes Sheet on SL p. 6.	☐ Go over the vocabulary word and enter it into the Earth Science Glossary on SL** p. 95.	☐ (*Optional*) Complete the copywork or dictation assignment and add it to the Earth Science Notes sheet on SL p. 6.
Do		☐ Do the demonstration entitled "Observing the Weather."	☐ (*Optional*) Complete the Climates activity.	☐ (*Optional*) Play a game of "I Spy."

**SSA = The Sassafras Science Adventures*
***SL = The Official Sassafras SCIDAT Logbook: Earth Science Edition*

Chapter 1: List schedule

Chapter Summary

The chapter opens with Blaine, Tracey, and Uncle Cecil making the harrowing journey to the Left-Handed Turtle Market, despite the Guardian Beast, a.k.a., Old Man Grusher's poodle. Cecil forgets his wallet and so the trio has to return home. The chapter flashes over to the Man With No Eyebrows where we learn more about his latest plan to stop the twins—the Forget-O-Nator. Back in the lab, the twins watch President Lincoln's review video from their botany. The twins also learn about the new "TASER" app before heading back to the market with their uncle. One the way back, the Guardian Beast finds the trio, a chase ensues, and Blaine is separated from the other two.

Essential To-Do's

Read

- ☐ Read the section entitled "Entering the territory..." of Chapter 1 in *SSA* Volume 4: Earth Science.*
- ☐ Read the section entitled "A Photosyntastic Program" of Chapter 1 in *SSA Volume 4: Earth Science.*

Write

- ☐ Set up the students' SCIDAT logbooks.
- ☐ Go over the vocabulary word and enter it into the Earth Science Glossary on SL** p. 95.
- ☐ Write observations learned from the demonstration on SL p. 5.

Do

- ☐ Do the demonstration entitled "Observing the Weather."

Optional Extras

Read

- ☐ Read one of the additional library books.

Write

- ☐ Write a narration on the Earth Science Notes Sheet on SL p. 6.
- ☐ Complete the copywork or dictation assignment and add it to the Earth Science Notes sheet on SL p. 6.

Do

- ☐ Play a game of "I Spy."
- ☐ Complete the Climates activity.

Supplies Needed	
Demo	• No Supplies Needed
Projects	• No Additional Supplies Needed

**SSA = The Sassafras Science Adventures*
***SL = The Official Sassafras SCIDAT Logbook: Earth Science Edition*

Chapter 1: Embarking on Earth Science

Read: Gathering Information

Living Book Spine

📖 Chapter 1 of *The Sassafras Science Adventures Volume 4: Earth Science*

(Optional) Encyclopedia Readings

- *Basher Science Planet Earth* pp. 70-71 (Weather), pp. 72-73 (Climate)
- *Usborne Children's Encyclopedia* p. 8 (1st half of Our Planet)
- *Discover Science Weather* pp. 6-7 (What is weather?)
- *Usborne Encyclopedia of Planet Earth* pp. 78-79 (What is weather?)

(Optional) Additional Library Books

📖 *On the Same Day in March: A Tour of the World's Weather* by Marilyn Singer and Frane Lessac
📖 *Weather and Climate: Geography Facts and Experiments* (Young Discoverers Series) by Barbara Taylor

Write: Keeping a Notebook

SCIDAT Logbook Sheets

This week, you will set up the students' SCIDAT logbook. You can use blank sheets of copy paper with dividers for each section or purchase *The Official Sassafras Student SCIDAT Logbook: Earth Science Edition* with all the pages and pictures from Elemental Science. For each of these sheets, you can have the students enter information only from *The Sassafras Science Adventures Volume 4: Earth Science*, or you can have them do additional research to gather more facts. The following video shares a peek inside a 2nd-grader's SCIDAT Logbook:

🖱 https://www.youtube.com/watch?v=0m4nj-K7s58

What you choose to do will depend upon the ages and abilities of your students. Below is an explanation of each of the student sheets.

Climate Sheets

The purpose of these sheets is to give the students an opportunity to work on their mapping skills as they study the climates of the different biomes around the world.

Area Map: The students will color and label the area of the globe that the twins visited that has the same general climate.

Climate Information: Have the students enter any of the information they learned about the biome's climate, such as average rainfall, average temperatures, and so on.

Interesting Facts: Have the students enter any interesting information they have learned about the climate of the region the twins are visiting.

Other Types: Have the students enter the names of any of the similar biomes they learned about. For example, when the twins are in the tropical rainforest, the students can enter temperate rainforest into this box. If the students are older, have them also include information about how the other type differs from the original biome's climate from the sheet.

Weather Record Sheets

The purpose of these sheets is to give the students an opportunity to work on their meteorological skills. You can have them enter the weather from your area over the two weeks they study a particular set of chapters. Alternatively, you can have the students look up and enter the weather information from the actual area that the twins have visited in the set of chapters.

High: Have the students will enter the high temperature for each particular day.

Low: Have the students will enter the low temperature for each particular day.

Rainfall: Have the students will enter the amount of rainfall, if any, that occurred on the particular day.

Conditions: Have the students enter information about the day's weather conditions, such as sunny or cloudy. If you have younger students, you can have them cut out the pictures for each type of weather. Templates of the weather pictures can be found in the appendix on p. 133.

Earth Science Record Sheets

The purpose of these sheets is for the students to record what they have learned about the various topics that are introduced in *The Sassafras Science Adventures Volume 4: Earth Science*.

Information Learned: The students should color the picture above the box if they desire and enter any information that they have learned about the particular topic.

Earth Science Notes Sheets

The purpose of these sheets is for the students to record any additional information that they have learned during their study of earth science. You can use these sheets to record additional narrations, copywork, or dictation assignments.

Project Record Sheets

The purpose of these sheets is for the students to record the projects they have done during the course of their study of earth science.

Earth Science Glossary

The purpose of the glossary is for the students to create a dictionary of terms that they have encountered while reading *The Sassafras Science Adventures Volume 4: Earth Science*. They can look up each term in a science encyclopedia or in the glossary included on pp. 143-144 of this guide. Then, have the students copy each definition onto a blank index card or into their SCIDAT logbook. They should also illustrate each of the vocabulary words. (Note—In *The Official Sassafras Student SCIDAT Logbook: Earth Science Edition* these pictures are already provided.)

Vocabulary

Have the older students look up the following terms in the glossary in the appendix on pp. 143-144 or in a science encyclopedia. Then, have them copy the definition onto a blank index card or into their SCIDAT logbook. This week, have the students look up the following term:

- Weather – Conditions, like windy, cloudy, sunny, or rainy, that change daily.
- Climate – The average weather in an area over a given period of time.

(Optional) Copywork

Copywork Selection

The weather can be windy, sunny, rainy, hot, or cold. It changes each day.

Dictation Passage

Climate describes the average weather in an area over a given period of time. Weather refers to the exact daily conditions, such as windy, cloudy, or rainy, in an area.

Do: Playing with Science

Scientific Demonstration: Observing the Weather

Begin by taking a moment to discuss the difference types of weather you can have in your area (i.e., sunny, windy, hot, cold, rainy, and so on). You can also discuss how important observation skills are for the scientist who is studying the weather. You can view the following blog posts for more information on the subject.

- https://elementalscience.com/blogs/news/63858627-observation-is-key
- http://elementalscience.com/blogs/homeschool-science-tips/71117699-3-ways-to-work-on-observation

Explain that today you are going to practice your observation skills while finding out what type of weather you can find in your area. Then, take a walk in your neighborhood or on a nearby nature trail. Allow the students to make observations and ask questions. Ask the students:

- ? What is the weather like today?
- ? What is the weather usually like in the different seasons?

Allow the students to observe the environment and find clues from there. You can record their answers on the sheet provided in the SCIDAT Logbook.

(Optional) STEAM Projects

Multi-chapter Activities

- Weather Poster – Over the coming weeks, you can have the students create a poster for each month's weather over your journey through earth science. You can download a current month-at-a-glance style calendar from here:
  - http://www.donnayoung.org/calendars/vertical-monthly-calendar.htm#block

Then, have the students determine the overall weather for each school day. You can use the weather pictures in the appendix on p. 133 for the daily weather, or have the students draw their own picture. This week, create your first calendar and add a weather picture for each day.

Activities For This Chapter

✂ I Spy – Play a game of "I Spy" to help the students work on their observation skills.

✂ Climates – Have the students research the climate in which they live. Then, have them write a few sentences or draw a picture to represent what they have learned. If you have them write a brief paragraph, their report could include the average yearly rainfall, the typical weather patterns, and average monthly temperatures for the year.

Chapter 2: Grid Schedule

Supplies Needed	
Demo	• 5 Paper cups, 4 Straws, 6" to 8" Thin wooden dowel, Tape, Hole Punch, Pencil
Projects	• Kite, Straw, Paper, Paint, Microscope slides, Vaseline

Chapter Summary

The chapter opens with Cecil and Tracey making it back to the market where they pay for the groceries. Tracey takes off on the zip lines to their first earth science location hoping that she will find Blaine there. Instead, Tracey finds her old local expert, Doc Hibbel, and meets her new expert, Sylvia Thunderstone as she learns about wind and Lucille the storm-chasing vehicle. We then flash over to Blaine who is waking up in the Man with No Eyebrow's basement. The MWNE puts him in the Forget-O-Nator, planning to erase his memory. Blaine thinks quickly and uses his phone to tase the inside of the machine. Meanwhile, Tracey learns the meaning behind Sylvia's last name and a bit more about global wind patterns. The chapter ends as the tornado sirens sound in the Cowboy Hall of Fame.

Weekly Schedule

	Day 1	Day 2	Day 3	Day 4
Read	☐ Read the section entitled "Where the wind..." of Chapter 2 in *SSA Volume 4: Earth Science.*	☐ Read the section entitled "Easterlies, Westerlies..." of Chapter 2 in *SSA Volume 4: Earth Science*	☐ (*Optional*) Read one or all of the assigned pages from the encyclopedia of your choice.	☐ (*Optional*) Read one of the additional library books.
Write	☐ Fill out a Earth Science Record Sheet on SL p. 9 on wind. ☐ Add weather to the Weather Information Sheet on SL p. 8. ☐ Go over the vocabulary words and enter them into the Earth Science Glossary on SL p. 95.	☐ Fill out a Earth Science Record Sheet on SL p. 10 on global wind patterns. ☐ Add facts to the Climate Information on SL p. 7.	☐ Write the information learned from the demonstration on SL p. 13. ☐ Go over the vocabulary words and enter them into the Earth Science Glossary on SL p. 95. ☐ (*Optional*) Write a narration on the Earth Science Notes Sheet on SL p. 13.	☐ Add weather to the Weather Information Sheet on SL p. 8. ☐ (*Optional*) Do the copywork or dictation assignment and add it to the Earth Science Notes sheet on SL p. 13.
Do	☐ (*Optional*) Fly a Kite. ☐ (*Optional*) Make Wind Patterns.	☐ *(Optional*) Create a Wind Painting ☐ (*Optional*) Do the Microscope Work.	☐ Do the demonstration entitled "Anemometer."	☐ (*Optional*) Add the week's weather to the weather poster.

Chapter 2: List schedule

Chapter Summary

The chapter opens with Cecil and Tracey making it back to the market where they pay for the groceries. Tracey takes off on the zip lines to their first earth science location hoping that she will find Blaine there. Instead, Tracey finds her old local expert, Doc Hibbel, and meets her new expert, Sylvia Thunderstone as she learns about wind and Lucille the storm-chasing vehicle. We then flash over to Blaine who is waking up in the Man with No Eyebrow's basement. The MWNE puts him in the Forget-O-Nator, planning to erase his memory. Blaine thinks quickly and uses his phone to tase the inside of the machine. Meanwhile, Tracey learns the meaning behind Sylvia's last name and a bit more about global wind patterns. The chapter ends as the tornado sirens sound in the Cowboy Hall of Fame.

Essential To-Do's

Read

- ☐ Read the section entitled "Where the wind..." of Chapter 2 in *SSA Volume 4: Earth Science.*
- ☐ Read the section entitled "Easterlies, Westerlies..." of Chapter 2 in *SSA Volume 4: Earth Science.*

Write

- ☐ Fill out a Earth Science Record Sheet on SL p. 9 on wind.
- ☐ Add weather to the Weather Information Sheet on SL p. 8.
- ☐ Fill out a Earth Science Record Sheet on SL p. 10 on global wind patterns.
- ☐ Add facts to the Climate Information on SL p. 7.
- ☐ Write the information learned from the demonstration on SL p. 13.
- ☐ Go over the vocabulary words and enter them into the Earth Science Glossary on SL p. 95.

Do

- ☐ Do the demonstration entitled "Anemometer."

Optional Extras

Read

- ☐ Read one of the additional library books.
- ☐ Read one or all of the assigned pages from the encyclopedia of your choice.

Write

- ☐ Write a narration on the Earth Science Notes Sheet on SL p. 13.
- ☐ Complete the copywork or dictation assignment and add it to the Earth Science Notes sheet on SL p. 13.

Do

- ☐ Fly a Kite or make Wind Patterns.
- ☐ Create a Wind Painting or do the Microscope Work.
- ☐ Add the week's weather to the weather poster.

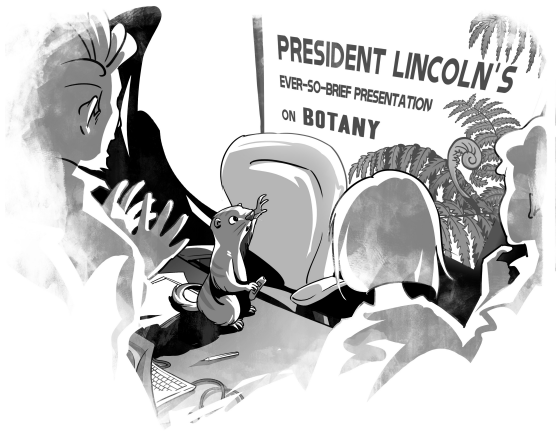
Supplies Needed	
Demo	• 5 Paper cups, 4 Straws, 6" to 8" Thin wooden dowel, Tape, Hole Punch, Pencil
Projects	• Kite, Straw, Paper, Paint, Microscope slides, Vaseline

Chapter 2: O-o-o-o-klahoma

Read: Gathering Information

Living Book Spine

📖 Chapter 2 of *The Sassafras Science Adventures Volume 4: Earth Science*



(Optional) Encyclopedia Readings

- *Basher Science Planet Earth* pp. 86-87 (Wind)
- *Usborne Children's Encyclopedia* p. 15 (Section on Windy Weather)
- *Discover Science Weather* pp. 16-17 (Blowing Around)
- *Usborne Encyclopedia of Planet Earth* p. 84 (Windstorms – Intro and Coriolis effect)

(Optional) Additional Library Books

📖 *Wind* by Marion Dane Bauer and John Wallace
📖 *Feel the Wind* (Let's-Read-and-Find... Science 2) by Arthur Dorros
📖 *The Wind Blew* by Pat Hutchins
📖 *Like a Windy Day* by Frank Asch

Write: Keeping a Notebook

SCIDAT Logbook Sheets

This week, you can have the students begin to fill out the Climate Sheet for the Oklahoman Prairie. They can also fill out the first part of their weather record sheets and the logbook sheets for wind and global wind patterns. The students could include the following information:

Climate Sheet - Oklahoman Prairie

Area Map: Have the students color the region where the Great Plains prairie is found. Have the students put a star on Oklahoma City. See attached map for the answer.

Climate Information

- The average temperature on the prairie can be as low as -20°F in the winter and as high as 100°F in the summer, but the averages is around 20°F in January and around 70°F in July.
- The average rainfall is between ten and thirty inches, but most of that occurs in the summer months.

Interesting Facts: Answers will vary.

Other Types

- There are two types of grasslands: temperate and tropical.
- The savannah, which is a tropical grassland, for instance, has a hot wet season that lasts for a few months and a slightly cooler dry season that lasts for about eight months.
- In the temperate prairie, there are cold winters and warm summers, just like the steppes of Europe and the pampas of South America.

Weather Record Sheet

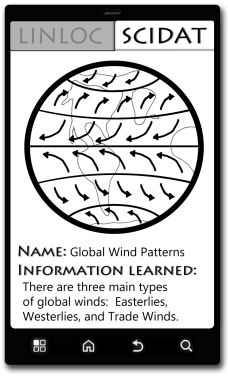
Have the students record the weather from your area or from Oklahoma City over the week.

Earth Science Record Sheet - Wind

Information Learned

- Wind is the movement of atmospheric gases on a large scale.
- Wind is the movement of air.
- We describe wind using two factors – speed and direction.
- Wind is caused by the uneven heating of the surface of the Earth. The surface is a mixture of land and water, which absorb heat from the sun's rays in differing amounts.
- During the day, the sun heats up the surface of the Earth and the air around it. The air over land heats up faster than the air over the water. Also, the air over places receive direct sunlight heats up faster than the air over land that receives indirect sunlight. Since the warm air weighs less, it rises, a change in air pressure occurs, and the cool air moves in to replace the space where the warm air was. This movement of warm and cool air causes wind.
- At night, the air over land cools quicker than the air over water, so wind is created once more.
- When there is lots of wind, we can harness the power of the wind and turn it into energy that we can use. This is known as wind power. Nowadays we use wind power to generate electricity, but in the past, it was used to pump water on the prairies.

Earth Science Record Sheet - Global Wind Patterns



Information Learned

- The movement of air around the globe is known as the global wind patterns. In a large scale, the winds that circle the Earth are created because the land at the equator is heated more than the land at the poles.
- Another factor that affects the winds around the globe is the spinning motion of the earth. This is known as the Coriolis Effect.
- Three main types of global winds – the easterlies, westerlies, and trade winds
    1. Trade winds – These winds are found near the equator. They flow north or south towards the equator and curve west due to the spin of the Earth.
    2. Prevailing westerlies – These winds are found in between the equator and the poles. The blow slightly towards the poles from the west to the east.
    3. Polar easterlies – These winds are found near the north and south poles. They blow up to the poles and curve from east to west.
- The jet stream is a river of fast-moving air about five to nine miles above the Earth's surface. The form at the boundaries of where the polar and temperate or tropical air meet. Because of the effect of the rotation of the Earth, the jet streams flow from west to east in a wave-like manner.

Vocabulary

Have the older students look up the following terms in the glossary in the appendix on pp. 143-144 or in a science encyclopedia. Then, have them copy each definition onto a blank index card or into their SCIDAT logbook.

- Wind – The movement of air in the atmosphere created by temperature differences.
- Gust – A short burst of wind moving at a high speed.

(Optional) Copywork

Copywork Sentence

Wind is the movement of air. We describe wind using two factors—speed and direction.

Dictation Selection

Wind is the movement of atmospheric gases on a large scale. It is caused by the uneven heating of the surface of the Earth. We describe wind using two factors—speed and direction. The movement of air around the globe is known as the global wind patterns.

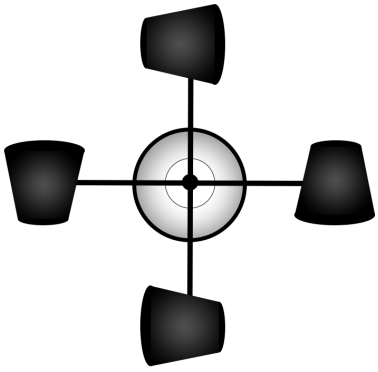
Do: Playing with Science

Scientific Demonstration: Anemometer

Materials

- ☑ 5 Paper cups
- ☑ 4 Straws
- ☑ 6" to 8" Thin wooden dowel (about the diameter of a pencil)
- ☑ Tape
- ☑ Hole Punch
- ☑ Pencil

Procedure



1. Have the students punch a single hole in the side of four of the cups about halfway down from the rim. Then, have them punch two sets of holes directly across form each other about half an inch down from the rim of the fifth cup. The holes on the fifth cup should line up to create a cross through the middle of the cup. Finally, use a pencil to poke a hole in center of the bottom of the fifth cup.
2. Next, insert a straw into the four cups with the single hole and secure it in place. Then, insert the four straws in the holes on the side of the fifth cup so that the cups are tilted sideways and the four straws meet in the center of the fifth cup. Use the tape to secure the four straws in an "x". (See the diagram for a visual reference.)
3. Now, push the dowel rod into hole in the bottom of the fifth cup. The students have not created a rudimentary anemometer.
4. Head outside to test their creation. Once outside, place the anemometer in dirt or hold it in your hand. Their device should stand upright, but still be free to turn in the wind.

Explanation

The students should see that when the wind blows, their anemometer turns. They should also observe that the faster the wind blows, the quicker the device turns. An anemometer is designed to measure wind speed and it a common instrument found at a weather station.

Take It Further

Have the students make a simple wind vane, which is a device to measure wind direction. A light ribbon or streamer will work for this. Simply have them hold one end of the ribbon in their hand and hold their hand above their heads. They can observe which way the ribbon moves in the breeze to determine which direction the wind is blowing.

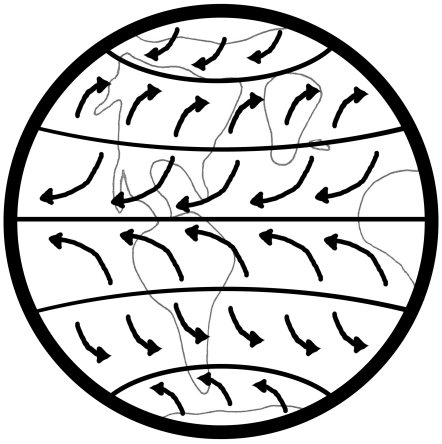
(Optional) STEAM Projects

Multi-chapter Activities

- ✂ Weather Poster – Have the students add to their weather poster this week. Weather template pictures can be found in the appendix on p. 133.

Activities For This Chapter

- ✂ Fly a Kite – If you have an exceptionally windy day, have the students head outside to fly a kite.
- ✂ Wind Patterns – Have the students label the draw and label the three main wind patterns on the globe. You can use the world map found in the appendix on p. 140. See the accompanying image for the answers.



- ✂ Wind Painting – You will need a straw, paper, and paint for each student. Have the students place a drop of paint at one end of their paper. Then, have them use the straw to blow the paint into a design!
- ✂ Microscope Work – Have the students look at what is found in the wind under the microscope. They can do this by covering a slide with a thin layer of Vaseline before setting the slide out on a windy day. Prop the slide up on a chair, so that it will be in the path of the wind. Wait about ten minutes before bringing the slide inside to view the slide under the microscope. Have the students complete one of the microscope worksheets found in the appendix on pp. 131-132.

Chapter 3: Grid Schedule

Supplies Needed	
Demo	• 2 Soda bottles, Duct tape, Water
Projects	• Straw, Dirt or dust, Shallow pan

Chapter Summary

The chapter opens with Cecil finding Blaine wandering around outside. He gets they boy back to the lab and then sends him off to Oklahoma on the zip lines. In the meantime, we find out that Blaine's taser-app destroyed the Forgot-O-Nator, which the Man With No Eyebrows vows to rebuild. Back in Oklahoma, Tracey finds Blaine and introduces him to Sylvia who teaches them about downbursts before they hop into Lucille to chase down a tornado. As they move into position, Sylvia shares about tornadoes with the twins. They anchor the vehicle down in a field directly in the path of the storm. As the tornado rapidly approaches, Sylvia notices some children trapped in a nearby building.

Weekly Schedule

	Day 1	Day 2	Day 3	Day 4
Read	☐ Read the section entitled "Damaging Downbursts" of Chapter 3 in *SSA Volume 4: Earth Science.*	☐ Read the section entitled "Thunderstone's Tornado" of Chapter 3 in *SSA Volume 4: Earth Science.*	☐ (*Optional*) Read one or all of the assigned pages from the encyclopedia of your choice.	☐ (*Optional*) Read one of the additional library books.
Write	☐ Fill out a Earth Science Record Sheet on SL p. 11 on downbursts. ☐ Add facts to the Climate Information on SL p. 7.	☐ Fill out a Earth Science Record Sheet on SL p. 12 on tornadoes. ☐ Add weather to the Weather Information Sheet on SL p. 8.	☐ Write information learned from the demonstration on SL p. 14. ☐ Go over the vocabulary word and enter it into the Earth Science Glossary on SL p. 96. ☐ (*Optional*) Write a narration on the Earth Science Notes Sheet on SL p. 14.	☐ Add weather to the Weather Information Sheet on SL p. 8. ☐ (*Optional*) Do the copywork or dictation assignment and add it to the Earth Science Notes sheet on SL p. 14. ☐ (*Optional*) Take Earth Science Quiz #1.
Do	☐ (*Optional*) Complete the Downbursts activity.	☐ *(Optional*) Watch the Tornado Video. ☐ *(Optional*) Complete the Watch or Warning activity.	☐ Do the demonstration entitled "Tornado in a Bottle."	☐ (*Optional*) Add the week's weather to the weather poster.

Chapter 3: List schedule

Chapter Summary

The chapter opens with Cecil finding Blaine wandering around outside. He gets they boy back to the lab and then sends him off to Oklahoma on the zip lines. In the meantime, we find out that Blaine's taser-app destroyed the Forgot-O-Nator, which the Man With No Eyebrows vows to rebuild. Back in Oklahoma, Tracey finds Blaine and introduces him to Sylvia who teaches them about downbursts before they hop into Lucille to chase down a tornado. As they move into position, Sylvia shares about tornadoes with the twins. They anchor the vehicle down in a field directly in the path of the storm. As the tornado rapidly approaches, Sylvia notices some children trapped in a nearby building.

Essential To-Do's

Read

- ☐ Read the section entitled "Damaging Downbursts" of Chapter 3 in *SSA Volume 4: Earth Science.*
- ☐ Read the section entitled "Thunderstone's Tornado" of Chapter 3 in *SSA Volume 4: Earth Science.*

Write

- ☐ Fill out a Earth Science Record Sheet on SL p. 11 on downbursts.
- ☐ Add facts to the Climate Information on SL p. 7.
- ☐ Fill out a Earth Science Record Sheet on SL p. 12 on tornadoes.
- ☐ Add weather to the Weather Information Sheet on SL p. 8.
- ☐ Write information learned from the demonstration on SL p. 14.
- ☐ Go over the vocabulary word and enter it into the Earth Science Glossary on SL p. 96.

Do

- ☐ Do the demonstration entitled "Tornado in a Bottle."

Optional Extras

Read

- ☐ Read one of the additional library books.
- ☐ Read one or all of the assigned pages from the encyclopedia of your choice.

Write

- ☐ Write a narration on the Earth Science Notes Sheet on SL p. 14.
- ☐ Complete the copywork or dictation assignment and add it to the Earth Science Notes sheet on SL p. 14.
- ☐ Take Earth Science Quiz #1.

Do

- ☐ Complete the Downbursts activity.
- ☐ Watch the Tornado Video or complete the Watch or Warning activity.
- ☐ Add the week's weather to the weather poster.

Supplies Needed	
Demo	• 2 Soda bottles, Duct tape, Water
Projects	• Straw, Dirt or dust, Shallow pan

Chapter 3: Lucille's First Rodeo

Read: Gathering Information

Living Book Spine

- 🕮 Chapter 3 of *The Sassafras Science Adventures Volume 4: Earth Science*

(Optional) Encyclopedia Readings

- *Basher Science Planet Earth* pp. 110-111 (Grassland)
- *Discover Science Weather* pp. 18-19 (Wild winds)
- *Usborne Children's Encyclopedia* p. 16 (Types of Storms)
- *Usborne Encyclopedia of Planet Earth* p. 85 (Tornadoes, Tornado alley, and Sea spouts)

(Optional) Additional Library Books

- 🕮 *Tornadoes!* by Gail Gibbons
- 🕮 *Tornadoes* by Seymour Simon
- 🕮 *Tornado Alert (Let's-Read-and-Find-Out Science 2)* by Franklyn M. Branley and Giulio Maestro
- 🕮 *A Grassland Habitat (Introducing Habitats)* by Kelley Macaulay and Bobbie Kalman
- 🕮 *Grasslands (About Habitats)* by Cathryn P. Sill

Write: Keeping a Notebook

SCIDAT Logbook Sheets

This week, you can have the students add to the Climate Sheet for the Oklahoman Prairie. They can also fill out the second part of their weather record sheets and the logbook sheets for downbursts and tornadoes. The students could include the following information:

Climate Sheet - Oklahoman Prairie

Climate Information

- The warm, humid summer on the grassland allow for the grass to grow very tall, but it also sparks lots of storms.
- On the grasslands, there are no natural barriers like trees or mountains, so there is a lot of wind.

Interesting Facts: Answers will vary.

Weather Record Sheet

Have the students record the weather from your area or from Oklahoma City over the week.

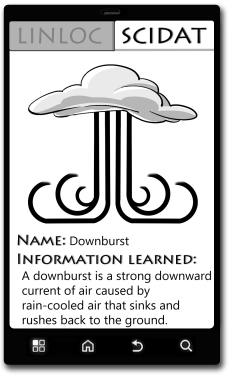
Earth Science Record Sheet - Downbursts

Information Learned

- Derechos are large clusters of strong thunderstorms that form in a long line and can cause widespread wind damage. This damage is caused by the abundance of downburst winds that derecho

storms can produce. These storms typically form in the late spring or summer.

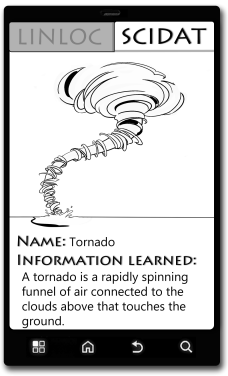
- A downburst is strong downward current of air often associated with a thunderstorm.
- Downbursts are caused by rain-cooled air that sinks and rushes back to the ground. When it reaches ground-level, it quickly spreads out in all directions which causes the production strong, damaging winds.
- Unlike tornadoes, winds in a downburst blow outwards from the point at which the wind hits the land. This forces things in the winds path out instead of sucks them in like a tornado would
- These storms typically form in the late spring or summer.



Earth Science Record Sheet - Tornadoes

Information Learned

- A tornado is a rapidly spinning funnel of air that touches the ground and is connected to the clouds above.
- Before a tornado touches the ground it is known as a funnel cloud.
- Most tornadoes only last a few minutes, but in that time they can tear up trees and houses, plus move cars, animals, and people.
- Tornadoes typically form from strong thunderstorms. In the midst of these storms clouds there is hot, humid, fast-moving air moving upward and cold, dry air moving downward. These two currents spiral and spin around each other, forming a funnel. If the currents are strong enough, this funnel will reach the ground to form a tornado.



- The Fujitsu scale is used to describe the strength of a tornado. It ranges from F0 to F5, with F5 being the strongest tornado. Each category has a wind speed range and a description of possible damage.
- The majority of tornadoes spins at around one hundred miles per hour,, which is a F1 on the Fujitsu scale. An F1 tornado can cause moderate damage like snapping trees, blowing around mobile homes, and damaging roofs.
- Most tornados occur in an area known as tornado alley, which includes the Great Plain states in the US. Over 500 tornadoes touch down in this area each year.

Vocabulary

Have the older students look up the following term in the glossary in the appendix on pp. 143-144 or in a science encyclopedia. Then, have them copy each definition onto a blank index card or into their SCIDAT logbook.

- Tornado – A spinning funnel of wind that touches the ground and is also connected to the clouds above.

(Optional) Copywork

Copywork Sentence

A tornado is a spinning funnel of air that touches the ground and the clouds above.

Dictation Selection

The Fujitsu scale is used to describe the strength of a tornado. It ranges from F0 to F5, with F5 being

the strongest tornado. Each category has a wind speed range and a description of possible damage. The majority of tornadoes spins at around one hundred miles per hour, which is a F1 on the Fujitsu scale.

(Optional) Quiz

This week, you can give the students a quiz based on what they learned in chapters 2 and 3. You can find the quiz in the appendix on p. 153.

Quiz #1 Answers

1. Warm, cold
2. B, C, A
3. D
4. B
5. F0, F5
6. C

Do: Playing with Science

Scientific Demonstration: Tornado in a Bottle

Materials

- ☑ 2 Soda bottles
- ☑ Duct tape
- ☑ Water

Procedure

1. Have the students fill one of the soda bottles two-thirds of the way with room temperature water.
2. Then, have them invert the second bottle and use the duct tape to attach the two openings together so that no water will leak out.
3. Once the two bottles are securely attached, have the students flip the bottles over and observe what happens

Explanation

The students should see a vortex or funnel form as the water moves from one bottle to the other. The swirling motion and movement of the water mimics the same conditions in the air that form a tornado.

Take It Further

Have the students add a bit of glitter and small sequins to the water to act as debris. Then, have the repeat the demonstration to see how debris acts in a tornado.

(Optional) STEAM Projects

Multi-chapter Activities

✂ Weather Poster – Have the students add to their weather poster this week. Weather template pictures can be found in the appendix on p. 133.

Activities For This Chapter

✂ Downbursts – You will need a straw, a bit of dirt or dust, and a shallow pan. Have the students

form a pile of dirt in the center of the shallow pan. Then, have hold the straw an inch above the pile and blow a burst of air directly down on the pile, just like a downburst. Have the students observe how the dirt was moved around by the wind and the damage the blowing did to the pile.

✂ Tornado Video – Have the students watch the following National Geographic video on tornadoes:

https://www.youtube.com/watch?v=pSajNLBH7cA

✂ Watch or Warning – Have the students research and learn about the differences between a tornado watch and warning. (Note—A watch means that conditions are favorable for the weather event to occur, while a warning means that the occurrence of the given weather event is imminent.) After they understand the differences, have the students create a poster sharing what a watch and a warning are, along with what a person should do when one is issued by their local weather service.

Earth Science Quiz #1

Chapters 2 and 3

1. Temperate grasslands, like the prairies of Oklahoma have (warm / cold)

   summers and (warm / cold) winters.

2. Match the global wind pattern with its description.

   Trade winds _____

   Prevailing westerlies _____

   Polar easterlies _____

   A. These winds are found near the north and south poles. They blow up to the poles and curve from east to west.

   B. These winds are found near the equator. They flow north or south towards the equator and curve west due to the spin of the Earth.

   C. These winds are found in between the equator and the poles. The blow slightly towards the poles from the west to the east.

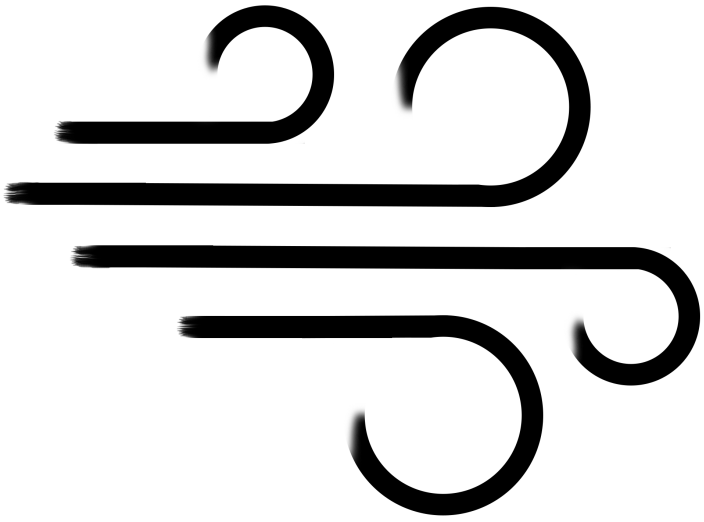
3. Wind is _____.

   A. The movement of atmospheric gases on a large scale

   B. Described by using two factors – speed and direction

   C. Caused by the uneven heating of the surface of the Earth

   D. All of the above



4. Tornadoes form _____.

A. Normally in the winter months

B. As two currents spiral and spin around each other

C. From weak storms with light rain

D. All of the above

5. The Fujitsu scale is used to describe the strength of a tornado. It ranges from F0 to F5, with _____ being the weakest tornado and _____ being the strongest tornado.

6. A downburst is _____ often associated with a thunderstorm.

A. A weak downward current of air

B. A strong upward current of air

C. A strong downward current of air

D. A weak upward current of air