

**NOEO  
SCIENCE  
BIOLOGY 1**  
INSTRUCTOR'S GUIDE

by Dr. Randy Pritchard

**noeo science**  
MOSCOW, IDAHO

## Noeo Science Packages

**GRADES 1-3 /  
AGES 5-8**

Biology 1  
Physics 1  
Chemistry 1

**GRADES 4-6 /  
AGES 9-12**

Biology 2  
Physics 2  
Chemistry 2

**GRADES 7-8 /  
AGES 12-15**

Physics 3  
Chemistry 3

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# INTRODUCTION



# Welcome to Noeo

Welcome to Noeo Science! Thank you for trusting us to provide you with quality materials for teaching science at home. We understand that many homeschooling parents do not have a science background and may feel a bit intimidated about teaching science . . . especially when it comes to the experiments! Our books and experiment kits have been carefully selected to be of the highest quality available, yet simple enough for even the most science-phobic teachers and students. We intensely searched through library catalogs, websites, and hundreds of books before deciding on what we believe are the “best-of-the-best.” We hope that you will agree and we’re always open to your comments and suggestions.

Our Instructor’s Guides provide a logical, focused progression through the books and experiments. Multiple sources of information are used to teach each science topic. However, you won’t need to spend your time searching for books or cross-checking indexes to make the curriculum flow. That work has been done for you!

## What does *noeo* mean?

**noeo** | (no eh’ o) | verb

1. To perceive with the mind, to understand, to have understanding.
2. To think upon, heed, ponder, consider. (*The New Testament Greek Lexicon*)
3. Train the brain.

### ROMANS 1:20

For since the creation of the world His invisible attributes, His eternal power and divine nature, have been clearly seen, being **understood** through what has been made, so that they are without excuse.

noeo

## The Noeo Philosophy

The essence of science is simply observing and describing God's creation. When scientists make a new discovery, they are seeing another part of creation revealed. Romans 1:20 tells us that His attributes, power, and divine nature are clearly seen in what has been made.

While some scientists deny that their discoveries are evidence of God's creation, there are many that do recognize His attributes in all of creation. Our children should not be protected from science because of some scientific theories that deny God. They should instead be immersed in the sciences so that "His invisible attributes, His eternal power and divine nature" will be clearly seen.

## The Noeo Method

You will find that the Noeo Science curriculum is different from all the rest. Each year of science will fill your child with wonder and excitement as they build a strong foundational knowledge of science. They'll be having so much fun that the learning will come naturally for them . . . and painlessly for you.

Noeo Science is variety-filled, with a structure that is best described as a balance between the classical method and the Charlotte Mason approach. We emphasize narration and summarization, vocabulary development, observation, and the scientific method. We do not promote rote memorization or the worksheet and test methodology, as we think that this approach is less valuable for long-term retention. The following table illustrates these characteristics:

| TEACHING METHOD               | CORRESPONDING NOEO SCIENCE CURRICULUM QUALITIES  |
|-------------------------------|--|
| <p><b>Classical</b></p>       | <ul style="list-style-type: none"> <li>• Emphasizes vocabulary development, especially in the younger years.</li> <li>• Develops critical thinking skills and logic through the use of the scientific method.</li> <li>• Incorporates the classical stages of learning, i.e., the Trivium (grammar, logic, and rhetoric).</li> </ul>   |
| <p><b>Charlotte Mason</b></p> | <ul style="list-style-type: none"> <li>• Provides the best books available (including “living books”).</li> <li>• Utilizes a child’s natural curiosity to acquire knowledge. “Studies serve for delight”.</li> <li>• Uses narration and notebooks rather than worksheets, tests, or repetitive drills to evaluate learning.</li> </ul> |

We think it is important to learn science from a variety of sources, using a variety of teaching techniques. Our curriculum does not use the traditional, single textbook approach to science education. We think variety will encourage more interest in science, particularly with younger students. All of the books are carefully selected to allow children to discover the beauty, complexity, orderliness, and wonder of God’s design. While some written work is expected, many hands-on activities are included within the bright, colorful, and well-written books. Living book biographies of many important scientists are included to provide a practical perspective.

Optional Internet references are also provided throughout the curriculum. Occasionally, a book may introduce a particularly secular viewpoint. We view these times as an opportunity for discussions and encourage you not to skip over or “cover up” this information. We do not provide “canned” answers for these discussions, but encourage instructors to

study the issues for themselves and to pray for guidance and understanding in providing answers to each student’s unique questions.

Just as creation is orderly and well organized, we think a good science curriculum should follow an orderly design. Each year of the curriculum will focus on biology, chemistry, or physics. Each of these three foundational sciences is studied independently for an entire year rather than jumping randomly from one subject to another without reason. The study of biology, chemistry, and physics is then repeated at a higher level and in more detail upon the completion of each three-year course of study (e.g. biology in 1st and 4th grade, chemistry in 2nd and 5th grade, etc.). Subjects that overlap multiple science disciplines, such as geology, weather, and astronomy, are included at logical points within the three major science studies. For example, astronomy is studied in parallel with the study of gravity within the physics curriculum.

| <b>NOEO COURSE</b>                    | <b>APPROXIMATE AGES</b> | <b>GRADE EQUIVALENT</b> | <b>CLASSICAL TRIVIUM STAGE</b>  |
|---------------------------------------|-------------------------|-------------------------|---------------------------------|
| Biology 1<br>Chemistry 1<br>Physics 1 | 5-8                     | 1-3                     | Early Grammar                   |
| Biology 2<br>Chemistry 2<br>Physics 2 | 9-12                    | 4-6                     | Late Grammar or<br>Early Logic  |
| Chemistry 3<br>Physics 3              | 12-15                   | 7-9                     | Late Logic or Early<br>Rhetoric |

Our curriculum is designed on a 4-day per week schedule. If you would prefer to do science twice weekly, then simply complete the first two days of scheduled readings and assignments on your first day, and

the last two days of reading and assignments on your second day. Alternatively, you may wish to do all of the reading on the first day and the assignments and experiments on the second day. The key is to understand what works best for you and your children and to adjust the schedule as necessary.

The daily time necessary to complete the assignments will vary with individual student ability and based on the content being studied. We provide the following table as a guideline of the approximate time that you can expect to spend on daily assignments:

|                   | <b>4-DAY SCHEDULE</b> | <b>2-DAY SCHEDULE</b> |
|-------------------|-----------------------|-----------------------|
| <b>Grades 1-3</b> | 15-20 minutes         | 30-40 minutes         |
| <b>Grades 4-6</b> | 20-30 minutes         | 40-60 minutes         |
| <b>Grades 7-9</b> | 30-40 minutes         | 60-80 minutes         |

## Noeo Lab Manuals

We provide reproducible sheets for creating science and lab manuals for use with the Noeo Science curriculum. The manuals are an integral part of the curriculum. We include suggested lab manual pages. Feel free to modify these sheets and to tailor your expectations for each child.

Your student will be asked to describe, sketch or summarize what they learn from the reading assignments, or to complete a lab sheet for their experiments. This method will encourage concentration and attention to detail. In addition, the lab sheets are designed to help your student to apply the scientific method in all of their experiments.

Younger students may need to “narrate” their descriptions and observations to you or an older sibling. You will need to determine the length and amount of detail that your student is capable of. We encourage you to increase this expectation over the course of time.

## Lab Experiments

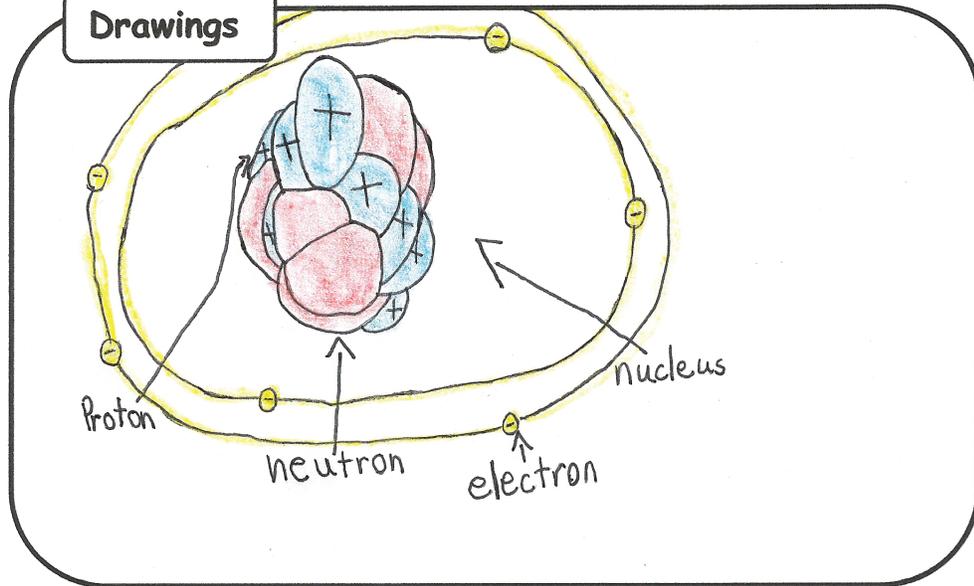
Science is not a spectator sport. The best way for your child to learn and truly comprehend science is by doing hands-on experiments and activities. We understand that this is probably the most difficult part of science for many homeschool families. That is why we were determined to find sources of high quality yet simple experiments.

We are pleased to say that the experiments in our curriculum will provide a strong science foundation without wreaking havoc on your daily schedule. For example, many of our experiments are provided through a unique arrangement with *The Young Scientists Club*. These experiment kits come complete with all the items that are normally difficult to find. They have won multiple awards for their high quality and have become increasingly popular among homeschoolers in recent years. We think you will be pleasantly surprised as your child progresses through these well organized, fully explained experiment kits while actually having fun learning science.

Our other experiments and activities are also carefully selected to provide relevant and interesting examples of the topics being studied. We provide a supply list for each week of the year, along with a “Master Supply List” at the beginning of the Instructor’s Guide. You’ll notice that most, if not all, of the items on this list can already be found in your home (honest!).

The following pages are samples copied from a science manual of a nine-year-old using our Chemistry 2 course. Younger students would orally “narrate” their summaries to an older sibling or adult. Older children should be expected to provide more detailed narrations (summarizations). It is not necessary to complete an experiment sheet for every experiment, especially with younger students. However, it is good to complete them often in order to establish a strong understanding of the scientific method.

## Drawings



### Reading Notes

Atoms are made up of: electrons, neutrons, and protons.  
Atoms are tiny particles of what everything is made.

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### Definitions

nucleus- The core section of an atom that contains protons and neutrons.

neutron- a subatomic particle with no electrical charge in the nucleus of an atom.

Proton- a positively charged subatomic particle in the nucleus of an atom.

electron shells- an energy level around the nucleus.

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Date 2/2/06

Experiment Name A feast for Yeast

What have you learned about this subject?  
(observation/research)

That yeast is alive!

What question are you trying to answer?  
(question)

What happens when you  
feed sugar to yeast?

What things do you need?  
(materials)

1. a bottle
2. yeast
3. sugar
4. warm water
5. a balloon
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_

What will you do to answer the question? (experiment/test)

put yeast in a bottle, put in sugar and put  
a balloon over it.

What do you think will happen? (hypothesis/prediction)

the balloon will blow up with CO<sub>2</sub> that the  
yeast makes

What happened? (results)

the balloon inflated.

Why do you think this happened? (conclusion)

The balloon catches the CO<sub>2</sub>.

# Resource List

## Books

- *Audubon's Birds of America Coloring Book*, by Paul E. Kennedy
- *The Boy Who Drew Birds: A Story of John James Audubon*, by Jacqueline Davies
- *DK First Animal Encyclopedia*
- *Experiments in Earth Science and Weather with Toys and Everyday Stuff*, by Emily Sohn
- *My First Book about Weather*, by Donald M. Silver & Patricia J. Wynne
- *One Small Square: Cactus Desert*, by Donald M. Silver
- *One Small Square: Seashore*, by Donald M. Silver
- *One Small Square: Woods*, by Donald M. Silver
- *Louis Pasteur and Pasteurization*, by Jennifer Fandel
- *Usborne Internet-Linked First Encyclopedia of the Human Body*
- *Weather Clues in the Sky: Clouds*, by Belinda Jensen
- *Exploring Nature Activity Book for Kids*, by Kim Andrews
- *Weather Ready-to-Read* by Marion Dane Bauer (*Wind, Rain, Clouds, Snow, Rainbow, Sun*)

## Experiment Kits

- Coprolite: fossilized turtle poop, by Compact Curiosities
- The Young Scientists Club Kits:
- Kit #10 Bacteria and Fungi
  - Kit #17 Heart and Lungs

- Kit #18 The Digestive System
- Kit #19 Bones and Muscles
- Kit #20 The Senses

# Weekly Schedule of Topics

|                                       |                |                                  |
|---------------------------------------|----------------|----------------------------------|
| <b>UNIT 1: WEATHER</b>                | <b>Week 1</b>  | The Atmosphere and Winds         |
|                                       | <b>Week 2</b>  | Clouds                           |
|                                       | <b>Week 3</b>  | Rain and Thunderstorms           |
|                                       | <b>Week 4</b>  | Rainbows & Weather Events        |
| <b>UNIT 2: BACTERIA AND FUNGI</b>     | <b>Week 5</b>  | Louis Pasteur                    |
|                                       | <b>Week 6</b>  | Bacteria and Fungi               |
| <b>UNIT 3: INVERTEBRATES</b>          | <b>Week 7</b>  | Creepy Crawlies                  |
|                                       | <b>Week 8</b>  | Creepy Crawlies & Flying Insects |
| <b>UNIT 4: HABITATS-CACTUS DESERT</b> | <b>Week 9</b>  | Reptiles                         |
|                                       | <b>Week 10</b> | Desert Creatures                 |
|                                       | <b>Week 11</b> | More Desert Creatures            |
| <b>UNIT 5: HABITATS-WOODS</b>         | <b>Week 12</b> | Woodland Mammals                 |
|                                       | <b>Week 13</b> | More Woodland Mammals            |
|                                       | <b>Week 14</b> | Trees and Their Inhabitants      |
| <b>UNIT 6: BIRDS</b>                  | <b>Week 15</b> | Birds                            |
|                                       | <b>Week 16</b> | John James Audubon               |
|                                       | <b>Week 17</b> | More about John James Audubon    |
| <b>UNIT 7: HABITATS-SEASHORES</b>     | <b>Week 18</b> | Tides                            |
|                                       | <b>Week 19</b> | Crustaceans                      |
|                                       | <b>Week 20</b> | More Seashore Creatures          |

|                             |                |                                  |
|-----------------------------|----------------|----------------------------------|
| <b>UNIT 8: OCEAN</b>        | <b>Week 21</b> | Fish                             |
|                             | <b>Week 22</b> | More Ocean Creatures             |
| <b>UNIT 9: WILD ANIMALS</b> | <b>Week 23</b> | Monkeys, Apes, and Cats          |
|                             | <b>Week 24</b> | Megafauna                        |
|                             | <b>Week 25</b> | Horses, Cows, and More           |
| <b>UNIT 10: HUMAN BODY</b>  | <b>Week 26</b> | The Heart and Lungs              |
|                             | <b>Week 27</b> | More about the Heart and Lungs   |
|                             | <b>Week 28</b> | The Digestive System             |
|                             | <b>Week 29</b> | The Digestive System and Kidneys |
|                             | <b>Week 30</b> | Skin, Hair, Bones, and Joints    |
|                             | <b>Week 31</b> | Bones and Muscles                |
|                             | <b>Week 32</b> | Bones Muscles, Brain, and Senses |
|                             | <b>Week 33</b> | The Senses                       |
|                             | <b>Week 34</b> | More about the Senses            |
| <b>UNIT 11: PLANTS</b>      | <b>Week 35</b> | Roots                            |
|                             | <b>Week 36</b> | Seeds                            |

# Additional Materials

The following is a complete list of items that will be used for the experiments over the entire 36-week course. This list includes many items that are common in most homes. Numbers in parentheses indicate the weeks the items are used. The list does not include the items that are provided in *The Young Scientists Club* kits.

## Office/School Supplies

pencil with eraser (1, 34, 35, 36)  
thumbtack (1)  
ruler (1, 35)  
scissors (1, 3, 27, 28, 29, 31, 32, 35, 36)  
tape (3, 27, 29, 31, 32)  
piece of white paper (4)  
duct tape (4)  
crayons or colored pencils (17, 18, 36)  
permanent marker (35)  
ruler (35)  
6 pieces of printed paper (36)  
5 rubber bands (3 thin, 2 thick) (36)

## Kitchen Items

large, clean glass jar (2, 3, 4, 35)  
matches (2)  
gallon zip-top bag filled with ice (2)  
aluminum pie plate (3)  
clear glass  
empty 2-liter bottles (4, 26, 27)  
3 small plastic cups (6)  
flour (6, 29)  
salt (6)  
milk (6)  
butter or margarine (6, 29)  
sugar (6, 29)  
plastic wrap (27)  
red food coloring (27)  
apple (+/- banana, pear, other fruit) (29)  
bread (29)  
vegetable oil (29)  
syrup (or vanilla) (29)  
3 clear plastic cups/bowls (or small  
flower pots) (35)  
3 plates or containers (35)  
water (35, 36)  
hollowed-out orange half or egg carton  
(or small potting container) (36)

## Gardening/Outdoor Items

3 small flower pots (or clear plastic cups/bowls) (35)  
dirt (35)  
leaves (35, 36)  
mulch (35)  
rocks (35)  
1 plant with roots (35)  
small hand shovel (35)  
potting soil (35, 36)  
vegetable and/or flower seeds (35)  
small potting container (or hollowed-out orange half or egg carton) (36)  
bag of mixed bird seed (36)  
flowers (36)  
4 sticks around a foot long (36)  
10 tree seedpods (includes things like pinecones, keys, acorns, drupes, pods, capsule nuts, or berries) (36)

## Miscellaneous

small fan (1)  
3 identical washcloths (2)  
2 rubber toys (3)  
2 metal toys (3)  
2 plastic toys (3)  
flat piece of styrofoam (3)  
bucket (27)  
newspaper (31)  
oil or vaseline (31)  
4 round objects (similar in size) (33)  
blindfolding cloth (33)  
hanging jewelry organizer, over-the-door shoe holder with pockets, or small plastic cups on a tray (35)  
spray bottle (35)  
cardboard box (36)  
bag or basket (36)

# Reproducibles

## Science & Lab Manual Pages

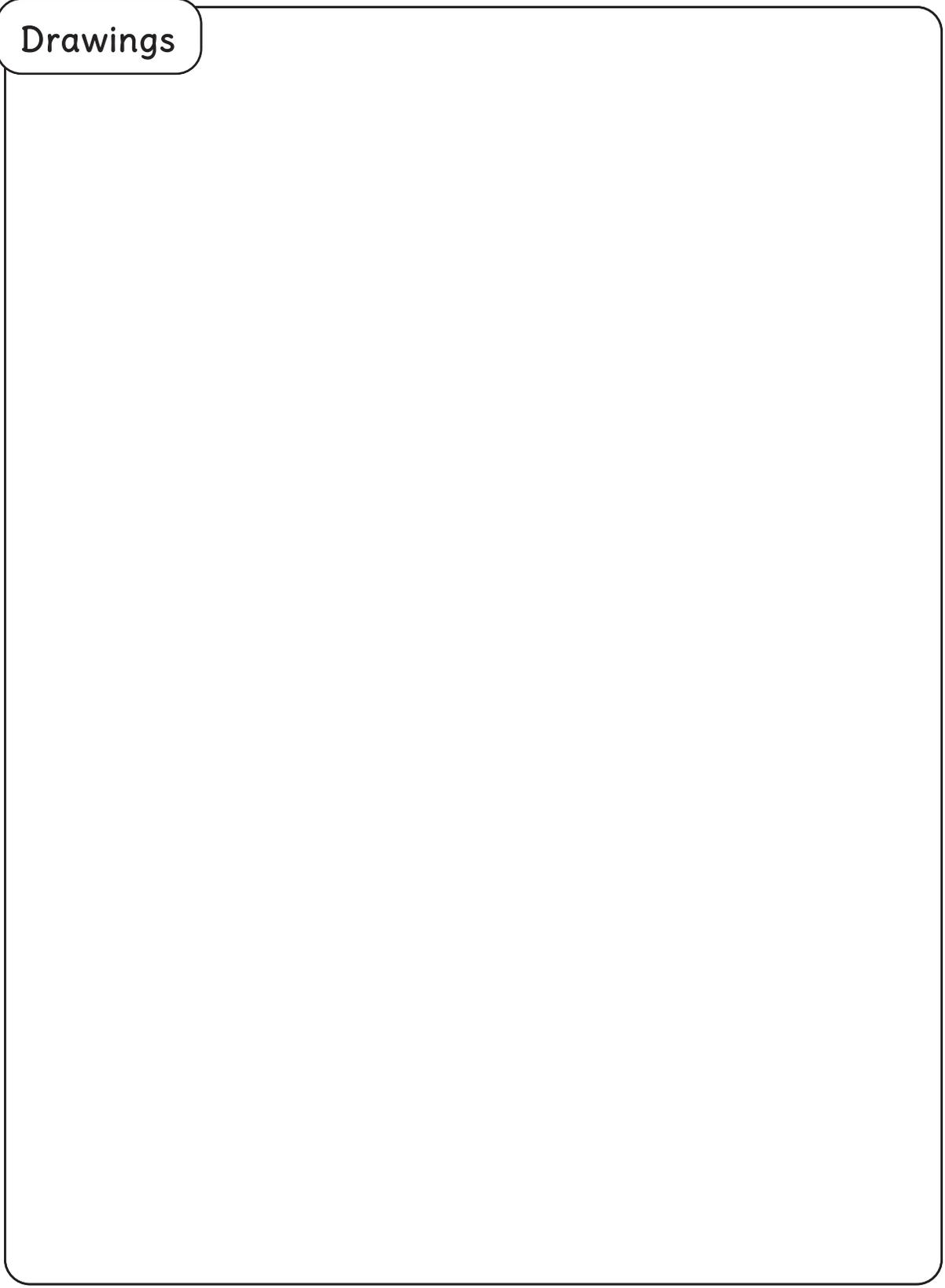
The following pages are provided for your convenience. Although all the pages you need are provided in your lab manual, they may also be found on our website ([noeoscience.com](http://noeoscience.com)) for free downloading and printing. New pages will also be added occasionally on the website. There are a variety of page styles to be used for notebook creation. Some contain a space for drawing and writing; others have space only for drawing or writing. Different line spacing options are also provided for young writers. Feel free to make as many copies of pages 18–29 as you need.

Please remember that younger students should begin by orally “telling back” what they have just learned. You may prefer to write their thoughts down in a notebook for them. As they become better writers, begin to have them write a sentence or two. Increase your expectations over time until you can find a balance between the student’s love for learning and their need for applied narration.

The lab manual pages (experiment pages) are intended to be used as a tool for teaching the scientific method. Again, younger students should not be expected to complete this sheet without assistance. Begin by orally asking some of the questions on the sheet after completing an experiment. Progressively increase your expectations for the completion of the experiment sheet. Older students should eventually be able to write a complete lab report without the need for this sheet.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Drawings**







Name: \_\_\_\_\_ Date: \_\_\_\_\_

Lab Experiment: \_\_\_\_\_

**What I Did**

Blank area for writing 'What I Did'.

**What I Saw**

Blank area for writing 'What I Saw'.

I think this happened because . . .

Four sets of horizontal lines for writing the explanation, each consisting of a solid top line, a dashed middle line, and a solid bottom line.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Lab Experiment: \_\_\_\_\_

### What I Did

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### What I Saw

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I think this happened because . . .

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**DAILY LESSON  
PLANS FOR  
READING &  
EXPERIMENTS**





**unit 1:**  
**WEATHER**

|   |    |
|---|----|
| Week 1: The Atmosphere and Winds .....    | 27 |
| Week 2: Clouds .....                      | 29 |
| Week 3: Rain and Thunderstorms .....      | 31 |
| Week 4: Rainbows and Weather Events ..... | 33 |



## Week 1: The Atmosphere and Winds

### Schedule

|   | DAY 1   | DAY 2               | DAY 3               | DAY 4                     |
|---|---------|---------------------|---------------------|---------------------------|
| <i>My First Book about Weather</i>              | pp. 1-2 | pp. 3-4             | pp. 5-7             |                           |
| <i>Ready-to-Read: Sun</i>                       |         | Read the whole book |                     |                           |
| <i>Ready-to-Read: Wind</i>                      |         |                     | Read the whole book |                           |
| <i>Experiments in Earth Science and Weather</i> |         |                     |                     | pp. 12-13:<br>Blown Away! |

### Overview

Begin this year by explaining what two things we mean by *science*: 1) science is the process we use to answer questions about the physical world we see around us (testing with experiments), and 2) science is the body of knowledge other people (scientists) have collected by using the scientific process (or scientific method).

You have to admit that it is strange that the world is a place where one day warmth can come from the sky, another day water, and (in some places) ice and snow. In this unit you will introduce your student to the atmosphere, which is what makes Earth's climate a place where life can flourish – so different from the Moon's, for example. This week you'll introduce

the atmosphere by answering the question every kid has had: What's up with the wind? Who's doing the blustering when it's windy outside?

## Supply List

- pencil with eraser
- thumbtack
- ruler
- scissors
- small fan

## Daily Lesson Plans

**Day 1** – Read the assigned pages, and explain what the “atmosphere” is and draw a picture of the four main layers of earth’s atmosphere in your lab manual. You may also color the picture in the book.

*NOTE: Younger students will narrate what they have learned. You may need to ask prompting questions to get younger students to begin to concentrate on the important topics in the reading assignments.*

**Day 2** – Read the assigned pages, and describe and/or sketch what you learned in your lab manual.

**Day 3** – Read the assigned pages, and describe and/or sketch what you learned in your lab manual.

**Day 4** – Set up the Blown Away experiment and record your observations in your lab manual. (The lab manual is made up of the reproducibles found at the beginning of this book on pp. 18-22. They can also be downloaded from the NOEO website if you need extras.)

## Week 2: Clouds

### Schedule

|   | DAY 1    | DAY 2     | DAY 3               | DAY 4                                      |
|---|----------|-----------|---------------------|--|
| <i>Weather Clues in the Sky: Clouds</i>         | pp. 4-11 | pp. 12-19 |                     | pp. 20-21, Experiment, p. 22: Make a Cloud |
| <i>Experiments in Earth Science and Weather</i> | pp. 8-9  |           |                     |  |
| <i>Ready-to-Read: Clouds</i>                    |          |           | Read the whole book |  |
| <i>My First Book about Weather</i>              |          |           | pp. 8-9             |  |

### Overview

You and your kid have perhaps looked for cloud shapes together. This week, your child may be surprised to learn that clouds are made of water in the sky. How that water gets up there, though, is what you'll spend most of your time on this week, as you dive into the details of clouds and the water cycle.

## Supply List

- 3 identical washcloths
- large, clean jar
- grown-up to light a match
- matches
- gallon-size zip-top bag filled with **ice**

## Daily Lesson Plans

**Day 1** – Read the assigned pages, and describe and/or sketch what you learned in your lab manual. Make sure you define (or can explain) *water cycle*.

Do the Water Cycle experiment as explained in the book. Carefully follow the steps, then answer the questions in step 3. Use your experiment worksheet to record your results.

**Day 2** – Read the assigned pages, and describe and/or sketch what you learned in your lab manual. Make sure you define (or explain) the different types of clouds: *cirrus*, *cumulus*, *cumulonimbus*, and *stratus*.

**Day 3** – Read the assigned pages, then color the pages of *My First Book about Weather* the way you know that they are supposed to look.

**Day 4** – Set up the Make a Cloud experiment and record your daily observations in your lab manual. Have fun and be careful!