

Creating the Science Notebook

A Manual for Elementary Teachers of Science

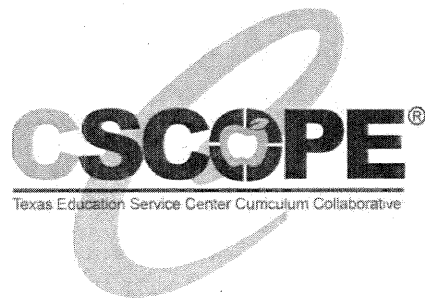


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Why Keep a Science Notebook?: What the Research Says

Science notebooks are important as reference tools for students to use when recalling what was done. The students gain a better understanding of how one concept affects another, and they can begin to see relationships between ideas across life, Earth, and physical science. The notebooks aid in the improvement of the student's vocabulary, and by expressing their thoughts through writing, students learn and understand the material. Science notebooks also provide information about classroom experiences; they imitate the journals that actual scientists use as they explore the world. Through writing in science notebooks, students engage in authentic scientific thinking as they carry out their own investigations. Science Notebooks include a question to explore, predictions, claims and evidence, a description of what was done, and what students learned (Klentschy, 2005). In addition they may incorporate narrative statements and drawings about the student's observations, data sets, diagrams, graphs, and tables. They may also include statements or thoughts of how the student could apply what they have learned in another situation. Science notebooks can be used to help students develop, practice, and refine their understanding of science, while also enhancing reading, writing, mathematics, and communications.

Science notebooks and journals are terms that are often used interchangeably. Although they do share some common characteristics (for example, both include questions and are creative), they differ in their format (Campbell and Fulton, 2003). Science notebooks focus on the more structured type of writing that accompanies an experimental, comparative, or descriptive investigation and the use of science process skills, whereas journals emphasize a more free-form type of writing that often expresses feelings and is found in literature reflection, fiction, and poetry. Therefore, while it is important for students to learn how to use both types of writings, science notebooks and journals should be distinguished from each other and maintained separately.

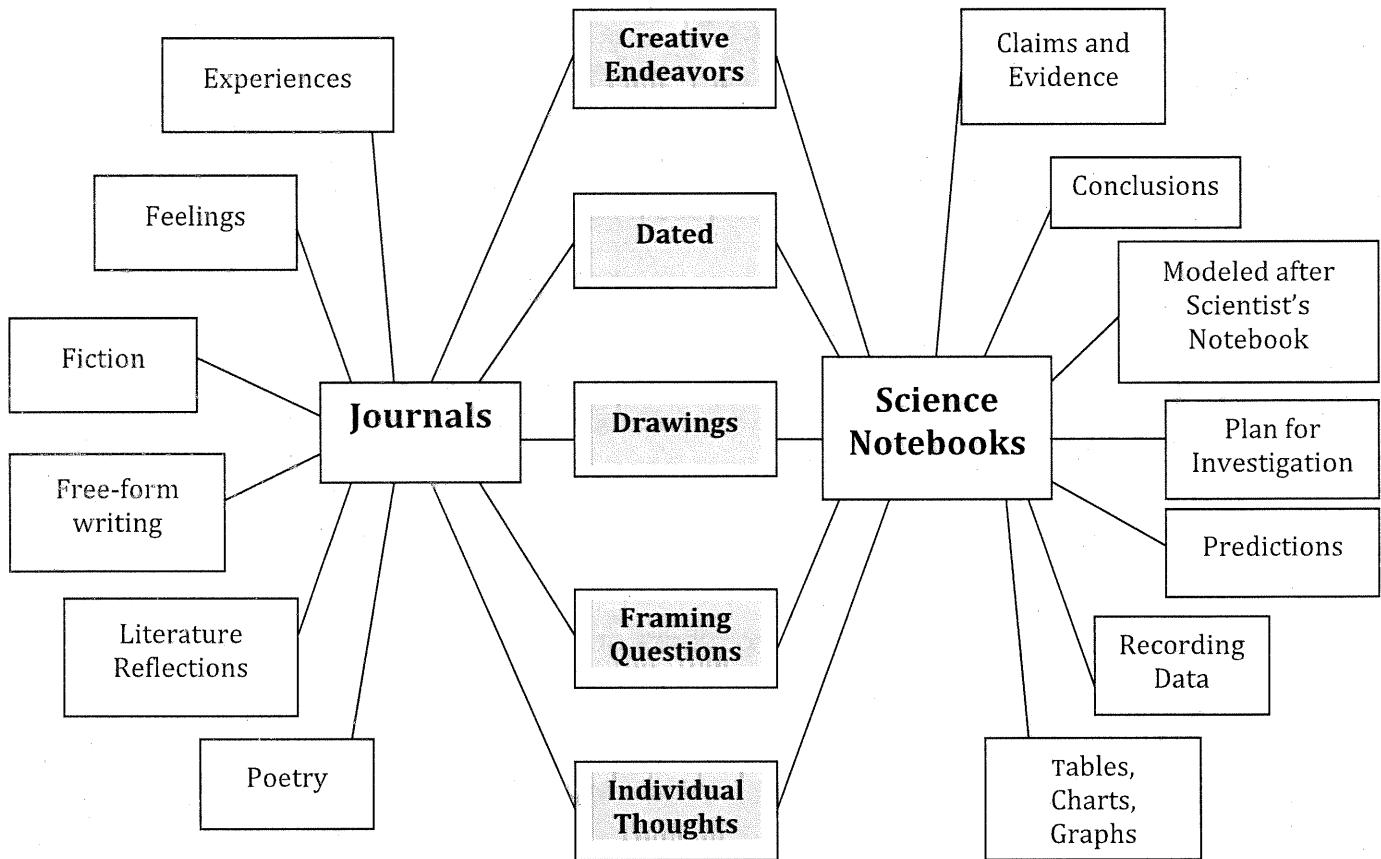
Science notebooks have a positive impact on writing achievement, if only because writing time is increased when science notebooks are employed. While these gains can be attributed in part to increased practice, much of the progress has to do with the type of writing in which students are engaged. Use of science notebooks is based on a model for reflective writing. Engaging in authentic tasks allows students to connect to their work, making it easier to collaborate with other "scientists" in the class to compare hypotheses and conclusions. Whether this collaboration is done by reading other students notebooks or by discussing scientific phenomena in small groups, communication is clearly enhanced.

Notebooks as an Assessment Tool

Standardized tests provide information about what students know and can do at the end of instruction (usually at the end of the school year), but there is also an immediate need to regularly monitor student progress in order to influence best instructional practices. Science notebooks provide one form of rich assessment data. Not only do students learn about themselves as scientists, teachers are informed about what and how students learn, and the effectiveness of their instructional practices. These kinds of data allow the teacher to adapt instruction to what students really need. This ongoing collection of data has become known as formative assessment. Formative assessment is assessment done within instruction as opposed to summative assessment (such as testing) that comes at the end of instruction. Unlike summative assessment, formative assessment happens early in the instructional process so that information learned from the assessment process can be used to inform instructional decisions. Formative assessment serves as a diagnostic tool to identify student strengths and weaknesses so a teacher can determine important next steps. Notebooks can also illuminate student misconceptions that the teacher can address. Science notebooks expose students' thinking and provide the teacher with important insights about student understandings.

About the Notebook

Journal vs. Notebook



Designing the Science Notebook

As the trend of keeping science notebooks grows, teachers have given feedback on 'what works best'. These suggestions are summarized below:

1. The hard cover composition books seem to work the best and last an entire school year without falling apart. Spirals can also be used, but the ones with perforated pages are not effective, as the pages tear out easily.
2. On the inside front cover, glue the Safety Contracts/Rules.
3. On the inside of the back cover, glue a copy of "Science Notebook Guidelines." This is one suggestion of how the science notebook could be kept.
4. Leave the next three pages in the science notebook blank. Page 'i' is for a Title Page, pages 'ii' and 'iii' are for a Table of Contents.
5. Page 1 is where students glue their copy of the Scientific Processes (Grade 5) or Processes for [Simple] Descriptive Investigations for Grades 1-4.
6. Page 2 is for the tools students will learn how to use.
7. Page 3 is for information about measurement (optional).
8. Other pages could be used for grading rubrics or formula charts.
9. Pages at the back can be used to create a resources section or a glossary.

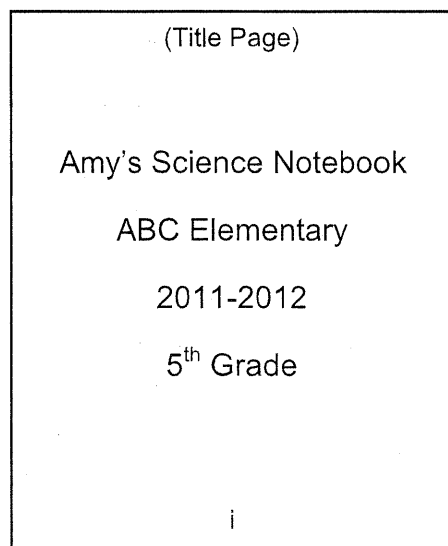
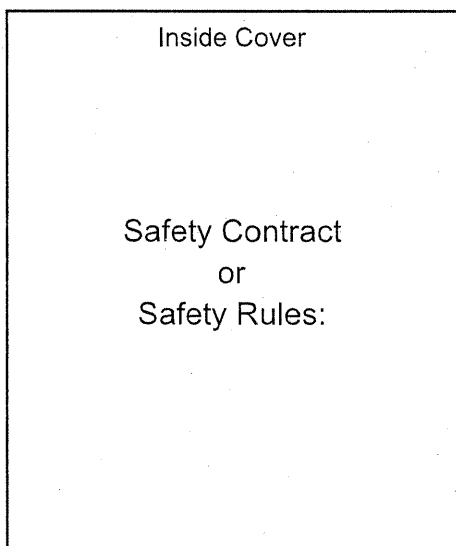


Table of Contents		
Date	Activity Title	Page
		ii

Table of Contents		
Date	Activity Title	Page
		iii

Page 1	
Scientific Processes	
(for simple experimental investigations: Grade 5)	
Problem	
Hypothesis	
Materials	
Procedure	
Data	
Results	
Conclusions	
Applications	

Page 1	
Processes for Descriptive Investigations	
(used in grades K-4)	
Ask questions	
Make inferences	
Select and use appropriate tools	
Observe	
Describe	
Compare and contrast	
Graph	
Illustrate	
Measure	
Investigate	

Page 2

Tools I Will Learn How To Use

Students have pictures of the tools they will learn to use at their grade level. After students have used the tool and understand its use, they can put a "check" by it. By the end of the year, all tools should be "checked off."

Page 3

Measurement Information
(optional)

This is used to emphasize measurement. Measurement is not just a math skill, but a life skill. It is an ongoing process- not something done once and forgotten.

Inside of Back Cover

Science Notebook Guidelines

Templates for Creating the Science Notebook

Notebook Labels



Science Notebook

Name

School Year



Science Notebook

Name

School Year



Science Notebook

Name

School Year



Science Notebook

Name

School Year



Science Notebook

Name

School Year



Science Notebook

Name













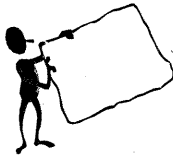
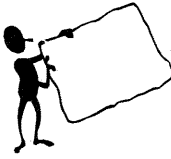


School Year

Table of Contents




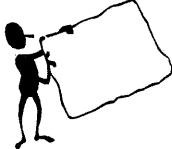
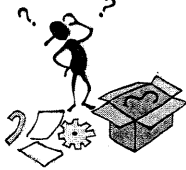



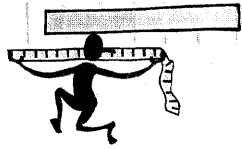

Date	Activity	Page	Grade (Optional)

Scientific Processes

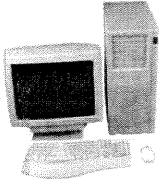


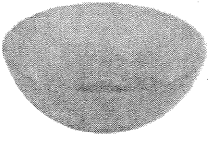

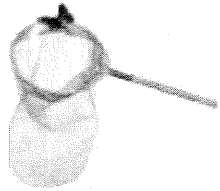
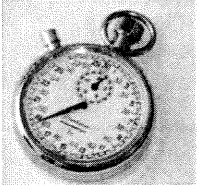
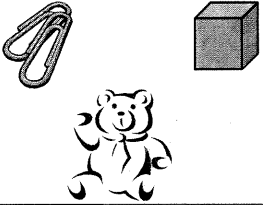
(for Simple Experimental Investigations: Grade 5)

<p>Problem</p> 	<ul style="list-style-type: none"> The question we want to investigate. 	<p>Problem</p> 	<ul style="list-style-type: none"> The question we want to investigate.
<p>Hypothesis</p> 	<ul style="list-style-type: none"> One possible answer to the problem or question. A statement about the expected outcome based on observation, knowledge, and experience. Written as an "If...then..." statement. 	<p>Hypothesis</p> 	<ul style="list-style-type: none"> One possible answer to the problem or question. A statement about the expected outcome based on observation, knowledge, and experience. Written as an "If...then..." statement.
<p>Materials</p> 	<ul style="list-style-type: none"> The equipment or tools needed to test the hypothesis and answer the problem or question. 	<p>Materials</p> 	<ul style="list-style-type: none"> The equipment or tools needed to test the hypothesis and answer the problem or question.
<p>Procedure</p> 	<ul style="list-style-type: none"> The steps you will follow to do your investigation. The method you will use to gather and record your data. 	<p>Procedure</p> 	<ul style="list-style-type: none"> The steps you will follow to do your investigation. The method you will use to gather and record your data.
<p>Data</p> 	<ul style="list-style-type: none"> Gather data. Observe and measure carefully. Record and organize your data so that you can learn from it. Display data in tables, charts, or graphs. Use clear labels. 	<p>Data</p> 	<ul style="list-style-type: none"> Gather data. Observe and measure carefully. Record and organize your data so that you can learn from it. Display data in tables, charts, or graphs. Use clear labels.
<p>Results</p> 	<ul style="list-style-type: none"> Record the results of the investigation using pictures and words. 	<p>Results</p> 	<ul style="list-style-type: none"> Record the results of the investigation using pictures and words.
<p>Conclusions</p> 	<ul style="list-style-type: none"> Write a conclusion. Describe the claims and evidence you used to determine whether your test supported your hypothesis. 	<p>Conclusions</p> 	<ul style="list-style-type: none"> Write a conclusion. Describe the claims and evidence you used to determine whether your test supported your hypothesis.
<p>Applications</p> 	<ul style="list-style-type: none"> How could the information be applied in another situation? 	<p>Applications</p> 	<ul style="list-style-type: none"> How could the information be applied in another situation?

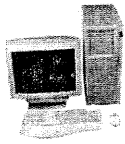

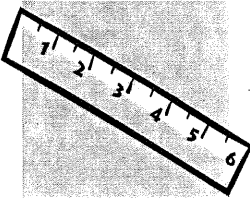
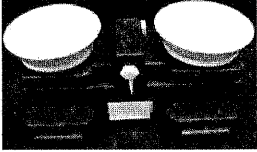
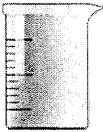

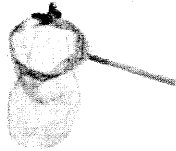


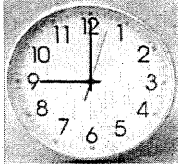





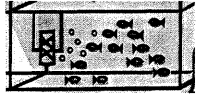
Processes for Descriptive Investigations (Grades K-4)

<p>Ask questions</p>  A stick figure is shown in profile, scratching its head with one hand and looking upwards with a question mark above its head, representing the process of asking questions.	<p>Use charts and graphs to display data</p>  A stick figure is standing next to several rectangular charts and graphs, some of which are being held up, representing the process of displaying data.
<p>Make inferences</p>  A stick figure is shown with a lightbulb above its head, indicating a moment of realization or inference.	<p>Describe in pictures, numbers and words</p>  A stick figure is holding up a large rectangular board or poster, representing the process of describing findings.
<p>Select and use appropriate tools</p>  A stick figure is standing next to an open box containing various tools like a wrench and a screwdriver, with question marks above its head, representing the selection of tools.	<p>Observe</p>  A stick figure is holding a telescope to its eye, representing the process of observation.
<p>Investigate</p>  A stick figure is holding a magnifying glass over a small object on the ground, representing the process of investigation.	<p>Illustrate and label</p>  A stick figure is holding up a drawing or illustration, representing the process of illustrating and labeling findings.
<p>Measure</p>  A stick figure is holding a long ruler and measuring a strip of material, representing the process of measurement.	<p>Provide claims and evidence</p>  A stick figure is shown in a dynamic, gesturing pose, representing the process of providing claims and evidence.

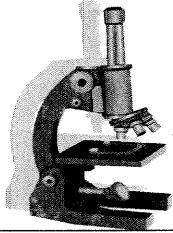
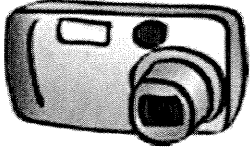
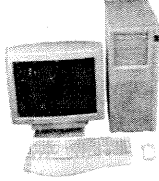

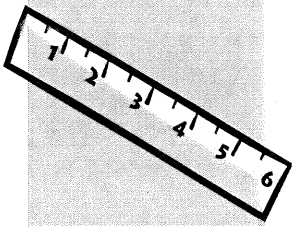
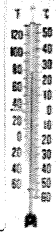
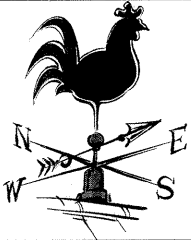

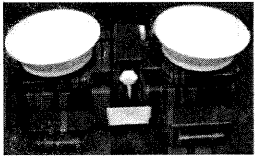
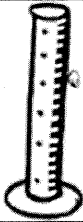
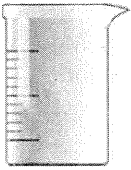

Grade 1: Tools I Will Learn How to Use

Computer		Hand lenses	
Balances		Cups	
Bowl		Magnets	
Collecting nets		Notebooks	
Timing device		Clock	
Non-standard measuring items		Safety goggles	
Demonstration thermometer		Wind sock	

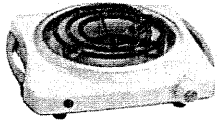
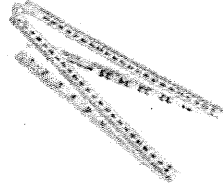
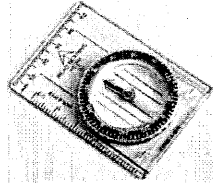

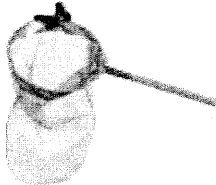
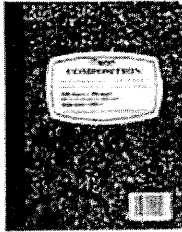
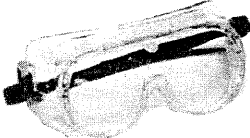
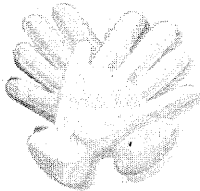
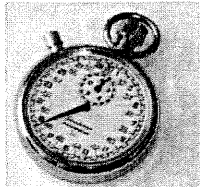
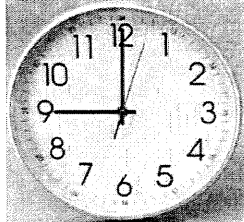

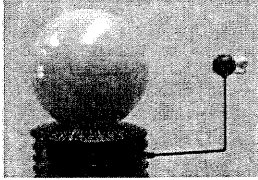
Grade 2: Tools I Will Learn How to Use

Computer		Hand lenses	
Rulers		Balances	
Plastic beakers		Magnets	
Collecting Nets		Notebooks	
Safety goggles		Clock	
Stop watch		Thermometer	
Wind vane		Rain gauge	
Materials to support observation of habitats such as terrariums		Materials to support observation of habitats such as aquariums	

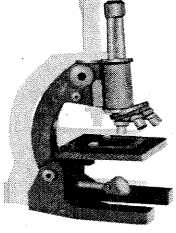
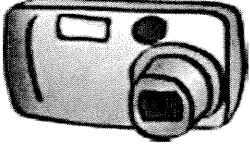
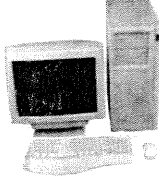

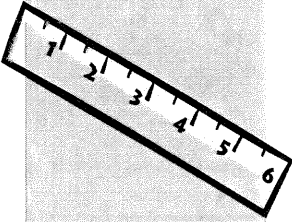

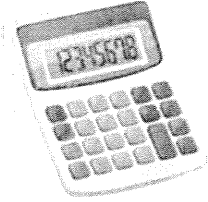
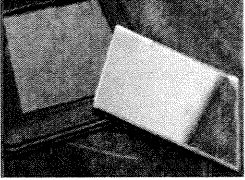
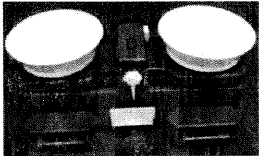
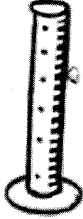
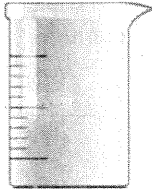

Grade 3: Tools I Will Learn How to Use

Microscope		Camera	
Computer		Hand lenses	
Metric rulers		Celsius thermometers	
Wind vane		Rain gauge	
Balances		Graduated cylinder	
Plastic beaker		Spring scale	

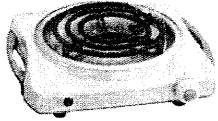
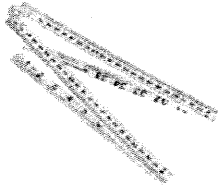
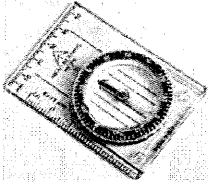

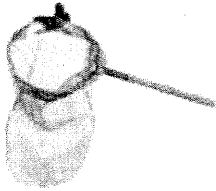
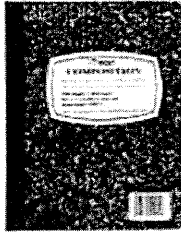
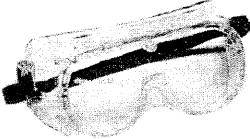
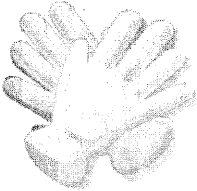
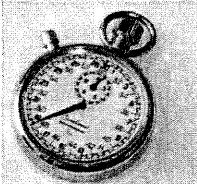
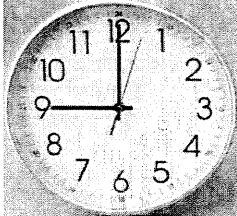
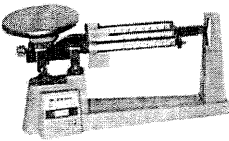
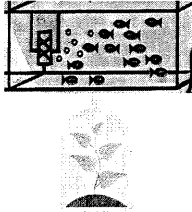
Grade 3: Tools I Will Learn How to Use (cont'd)

Hot plate		Meter stick	
Compass		Magnets	
Collecting nets		Notebooks	
Safety goggles		Gloves	
Timing device		Clock	
Sound recorder		Earth, Sun, Moon system model	

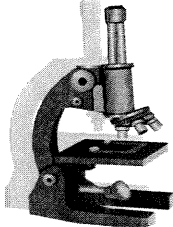
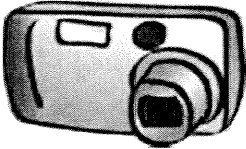


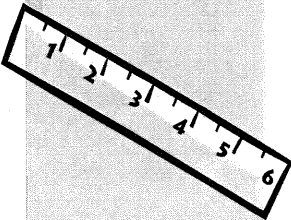

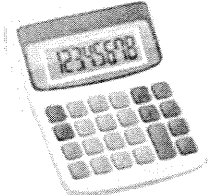
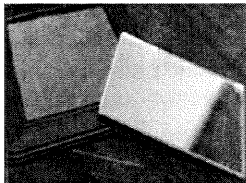
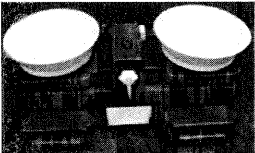

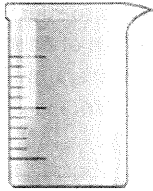

Grade 4: Tools I Will Learn How to Use

Microscope		Camera	
Computer		Hand lenses	
Metric rulers		Celsius thermometers	
Calculator		Mirror	
Balances		Graduated cylinder	
Plastic beaker		Spring scale	

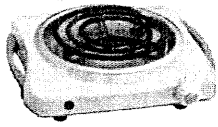
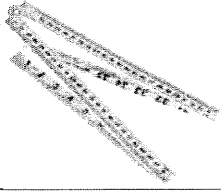
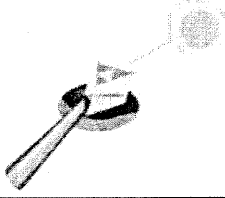

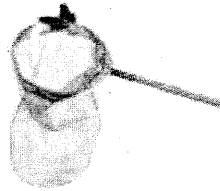
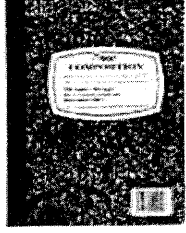
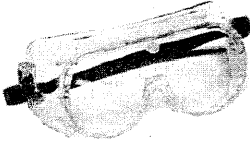
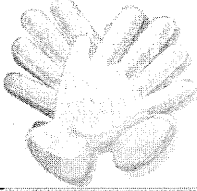
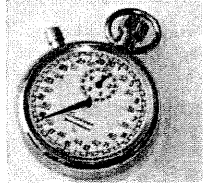
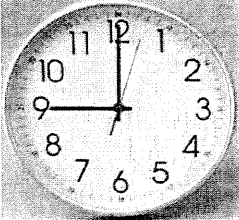
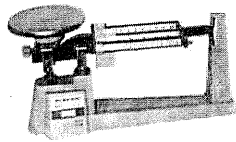
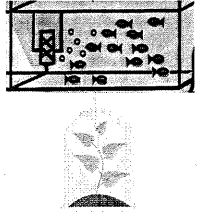
Grade 4: Tools I Will Learn How to Use (cont'd)

Hot plate		Meter stick	
Compass		Magnets	
Collecting nets		Notebooks	
Safety goggles		Gloves	
Timing device		Clock	
Triple beam balance		Materials to support observation of habitats such as terrariums and aquariums	

Grade 5: Tools I Will Learn How to Use

Microscope		Camera	
Computer		Hand lenses	
Metric rulers		Celsius thermometers	
Calculator		Mirror	
Balances		Graduated cylinder	
Plastic beaker		Spring scale	

Grade 5: Tools I Will Learn How to Use (cont'd)

Hot plate		Meter stick	
Prism		Magnets	
Collecting nets		Notebooks	
Safety goggles		Gloves	
Timing device		Clock	
Triple beam balance		Materials to support observation of habitats such as terrariums and aquariums	

Measurement Chart

We can measure...	Using these tools...	Customary units	Metric units
time			
temperature			
volume			
capacity			
weight			
mass			
area			
linear measurement: length, width, height, perimeter			

Science Notebook Guidelines

Scientists use notebooks in the ways listed below:

- Write down information and questions
- Record data from investigations
- Make drawings of investigations
- Make graphs, tables, and charts to organize information
- Reflect on experiences and identify new concepts

The following rules will help you create an interesting and informative notebook to show what you have experienced and learned in science.

- Write or print neatly and legibly
- Title and date each entry to help remind you of the topic
- Keep a table of contents
- Number the pages (top, bottom, centered, corners- your choice)
- Erase mistakes or mark through them with one line- do not scribble or scratch out.
- Label all drawings clearly
- Use sentences to communicate your observations, plans, explanations, and conclusions
- Create a 'resources' section (optional)
- Create a glossary

Some sentence starters you may want to try:

I wonder...

I was really surprised when...

I see patterns in...

This relates to...

What if...

This reminds me of...

Could the outcome be changed if...

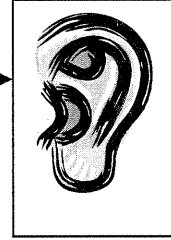
I expect to see...



Sample Safety Contract Grades K-2

Safety Rules

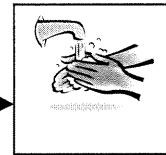
1. I will listen carefully.



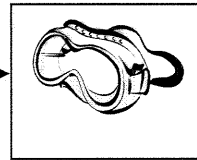
2. I will follow directions.



3. I will wash my hands after science activities.



4. I will keep myself and others safe.



Safety Contract

I will be a responsible scientist.

Student Signature

Date

Parent/Guardian Signature

Date

Teacher Signature

Date



Sample Safety Contract Grades 3-5

1. I will act responsibly at all times during science activities.
2. I will follow the teacher's instructions and laboratory procedures carefully.
3. I will wear safety goggles and protective clothing when instructed to do so.
4. I know the class emergency plan.
5. I will immediately notify the teacher of any emergency.
6. I will tie back long hair, remove jewelry, and wear closed-end (both toes and heels) shoes when told to.
7. I will not taste, eat, drink, or inhale anything during science class unless instructed to do so by the teacher.
8. I will tell the teacher if I see someone or something that is unsafe.

The top part of the contract will be kept by the student and placed in their science notebook. After the appropriate signatures are in place, the bottom section of the safety contract will be kept on file by the teacher.

Safety Contract

I have reviewed these rules in class with my teacher and at home with a responsible adult. I agree to follow these rules and any additional instructions, written or verbal, given by the teacher or the school.

Student Signature: _____

Parent/Guardian Signature: _____

Teacher Signature: _____

Sample Rubric for Grading

Scoring Rubric for Science Notebooks

Proficient 4	Competent 3	Emerging 2	Beginning 1
Demonstrates understanding of unit/lesson concepts	Demonstrates understanding of most unit/lesson concepts	Demonstrates partial understanding of unit/lesson concepts	Demonstrates no understanding of unit or lesson concepts
Demonstrates understanding of unit or lesson vocabulary	Demonstrates understanding of most unit or lesson vocabulary	Demonstrates partial understanding of unit or lesson vocabulary	Demonstrates no understanding of unit or lesson vocabulary
Provides complete explanation of question	Provides partial explanation of question	Provides fragmentary explanation of question	No response to question
Drawing is complete and labeled with relevant detail	Drawing is scientifically labeled with some relevant detail	Drawing has incorrect, missing, or incomplete labels and little detail	No drawing

Instructor's Comments:

Student's Comments:

References

Campbell, B., & Fulton, L. (2003). *Science notebooks: Writing about inquiry*. Portsmouth, NH: Heineman.

Klentschy, M. (2005, November/December). Science notebook essentials: A guide to effective notebook components. *Science and Children*. 24-27.