

Name/Date: Michael 1115 Activity Sheet 5

Wheels Overcome Friction

- This building stone is very heavy and hard to move! How could these workers make it easier to move the stone?
Use animals to help pull it.
- Why doesn't your brick slide easily? Because of the friction between the brick and the rug.
- How much force did it take to drag the brick?
About 6 1/2 units
- How much force did it take to roll the brick on dowels?
About 1 1/2 units a lot less
- A roller is a kind of wheel. How do wheels make it easier to move things?
Wheels lessen friction from the object you are trying to move.
- Now you know how the workers moved the building stone with less force. Finish the picture above by drawing the missing parts.

friction - a force between two things rubbing together
- it makes things move slower
- it can make heat

Things with wheels

- school bus
- cars
- bike
- roller skates
- FFVH
- skate board

What I think things have made it easier
Wheels lessen

Name/Date: Michael 4110 Activity Sheet 6

Observing Earthworms

- Measure your earthworm. How long is it? 4 inches
- Describe your earthworm.
long thin, wiggly, and brownish with lines around it.
It has a light brown band around it.
- Draw your earthworm and label its body parts.
- Does your earthworm prefer to be in the light or in the dark? dark
- How does your earthworm respond to soil?
It moves over to the soil. It started to dig in it.
- How does your earthworm respond to water?
It moves away from the water.
- Where do you think your earthworm will go in the terrarium?
I think it will go in the soil.
- Put your earthworm into your terrarium and watch it for 5 minutes. What did it do?
It moved around on top of the ground and then dug into the soil.

What I know about earthworms

- live in ground
- come out in the rain
- long and skinny
- hard to hold
- move like a snake

Questions

- What is the clitellum for?
- Will the earth worm grow longer?
- What are the lines around the body?
- Can it move backwards?

What I notice

how it moves

It stretches out long and then shrinks up and then stretches out in front again.

What Is a Science Notebook?

A science notebook is simply a written account of what students do and learn in science class. Notebooks provide students with a place to write regularly about science and to compile an ongoing record of all their science observations and discoveries. When they write in their science notebooks, students model a key characteristic of scientists through the ages and across all disciplines: recording information.

Science notebooks can take many forms, depending on the grade level and instructional goals. They might be stapled sheets of plain, lined, or graph paper with construction paper covers; composition books; spiral bound notebooks; loose-leaf binders; folders with pockets and fasteners; or booklets of printed student recording and

response sheets. The latter option, through prompts and organizers, ensures that students address important questions and record key data. Whatever the form, the notebook allows students to thoroughly document what they have done. It thus becomes a source of information for discussion and for further writing, inquiry, and exploration.

Getting Started

When you introduce science notebooks to students who have never used them, you will need to give students a purpose for writing. Explain to students that they are scientists, and scientists always document their work in writing. A scientist's notebook is always on the worktable or laboratory bench, and it is always open.

Also, scientists must be able to repeat their experiments. They record data carefully and in detail in order to be able to reconstruct the who, what, where, when, how, and why of their science work. And scientists must be able to share their ideas, plans, discoveries, and questions with others. Notebooks are the foundations of science communication.

Students unfamiliar with notebooking may also need to be told at first what to record. Be explicit in your guidance. Use posters or overheads to show sample notebook entries. Build into your science instruction the practice of writing *while* investigating. Explain the importance of recording on the go, not relying on memory later. Pause periodically during class to remind students to write about what they did or noticed, to record their questions, to note any surprises, and so on.

To ensure that students include meaningful reflections, post prompts or questions on sentence strips around the room, such as

I predict . . . because . . .

I want to find out . . .

I still wonder . . .

This reminds me of . . .

I learned . . .

As students become more proficient in using their notebooks, they lessen their dependency on reminders and prompts.

With practice, students should come to use their science notebooks as scientists would, *before*, *during*, and *after* every hands-on investigation or other science experience, such as reading or field trips. For example,

- *Before*—formulate the question, tap prior knowledge, make predictions, develop hypotheses, plan the investigation, state a purpose
- *During*—record materials and equipment, procedures, observations, data
- *After*—reflect, interpret, draw conclusions, generate new questions, communicate ideas to others

What Goes Into a Science Notebook

Student Entries

As a practical consideration, have students date and number the pages of their notebooks. They can then maintain a cumulative table of contents, which will be valuable as they use the notebook for reference or review.

Although your students' notebooks will all look different, certain common elements are essential to every entry:

- Date of the entry
- Title of the activity, problem, or reading
- Subheadings to organize the work

Subheadings for recording an investigation might be

Question—What I want to find out

Prediction—What I think will happen

Plan—Materials and procedure

Observations and Data—What happened

Conclusions—What I learned

Next Steps—What new questions arose

Subheadings for taking notes on a science reading might be **Predictions, Main Ideas, New Words, and My Questions.**

Notebook entries can take a variety of forms, reflecting the diversity of activities in a science unit. Given the various types of information being recorded and the various ways of organizing ideas, the following are only a few of the possible entry formats:

Activity sheets—prepared worksheets to guide students as they design, conduct, and respond to an investigation. This instructional support, or scaffolding, helps students build their understanding of new content and processes.

Drawings—sketches, illustrations, or diagrams showing materials, setups, observations, and outcomes. Remind students always to use labels on their art.

Procedures, notes, and observations—

lists, outlines, notations, and brief descriptions. Quick and versatile, this is probably the most common method of recording data in notebooks.

Graphs, charts, and tables—

graphic methods for recording and displaying data and results for at-a-glance visualization and comparison. Bar graphs show how much or how many; line graphs show how things change over time; pie graphs show the relationship of parts to the whole. Charts and tables sort information into groups for evaluation and comparison.

Graphic organizers—pictorial formats, such as KWL charts, Venn diagrams, flowcharts, T-charts, cause-and-effect charts, and concept webs, that show how ideas, objects, and events are connected. Consider preparing a bulletin-board or poster display of sample organizers, so that students can explore these alternative ways to communicate information and, even better, develop their own.

Inserts—supporting materials such as supplementary readings, photographs, artifacts, samples, or models attached to a notebook page or placed in a pocket.

Responses to writing prompts—written answers to teacher-provided writing generators, such as cloze statements, designed to trigger ideas and access knowledge. For example,

Write what you already know about ____.

How is ____ similar to (different from) ____?

Explain why ____.

Prompts are especially helpful for students as they begin using notebooks.

Glossary—science vocabulary and definitions, written or drawn. Students can create a unit glossary at the back of their notebooks or integrate a vocabulary feature into every entry. In addition to the new word and its meaning, a glossary entry might include examples and the word used in an original sentence.

Teacher Feedback

The science notebook is a working document whose primary audience is the student. However, let students know that you will be reviewing their notebooks periodically to track their progress. By ongoing interaction with notebooks, you can question and prompt each student's thinking to further his or her learning.

During science class, circulate to be sure that notebooking is occurring throughout the class period. That is, do not relegate notebook work to the closing two or three minutes of the lesson, when it is too easy to drop altogether. This also sends the message that writing is marginal to science inquiry. As students are investigating and writing, ask guiding questions to stimulate and encourage the process.

Periodically collect the notebooks and read them to check for understanding. Write feedback to students in the notebook, either directly on the pages or on sticky notes. Make feedback concrete and constructive. An effective critical comment has two parts: (1) recognizing what the student has done well, and (2) explaining how he or she can improve. Let students know what they are doing right. Compliment them, as appropriate. Then, be specific:

- *Press for explanations:* "I'm not sure what this diagram shows."
- *Challenge them to go further or dig deeper:* "Why do you think this is important?"
- *Invite connections:* "Does this remind you of anything else we have studied?"
- *Ask them to fix something:* "Add column heads to the table." If data is missing, remind students to get the information from their small group or science partner.
- *Encourage elaboration:* "What would happen if . . .?"

Science Notebooks Help Students

Building Science Comprehension

Writing about science is essential to the process of learning science. In fact, notebooks and inquiry science go hand in hand. As students record their investigations, they clarify their thinking and deepen their conceptual understanding of science facts, principles, and vocabulary. Notebooks are an effective tool for making students better observers, planners, communicators, questioners, describers, classifiers, interpreters, and analyzers—in short, scientific thinkers.

Organizing Knowledge

Writing about science also demands that students find meaningful ways to record and reflect on their science experiences. Thus a second benefit to students, after understanding science content, is in the area of using recording strategies. Notebooks encourage students to discover and develop tools for “making meaning” of science observations. As students share and discuss notebook entries, they discover that information and ideas can be communicated in different ways and that some methods are better suited for certain types of information. Over the course of a unit, a science notebook should demonstrate progress in using appropriate recording strategies and crafting organized and thoughtful entries. This notebook becomes a valuable resource for review, class discussions, follow-up projects, long-term reports, and other writing tasks.

Improving Literacy Skills

Science notebooks incorporate writing into every science lesson, and writing strengthens language skills. Gains in writing performance and other literacy skills, such as vocabulary building, are not simply the result of extra practice, although that should not be minimized. Improved ability is related to the many types of writing done. Science notebooks introduce students to conceptual writing (ideas), expository writing (information), description (observations), persuasion (claims and evidence), in addition to narration, explanation, opinion, and creative expression.

A key feature of notebook writing is purpose. The concrete phenomena and hands-on experiences of science give students meaningful content to write about. This is especially true when students are investigating their own questions.

Because of the strong relationship between science processes and reading comprehension skills and strategies, both are enhanced in science notebooks. A scientifically literate student can

- state main ideas
- note details
- compare and contrast
- predict
- sequence events
- distinguish fact from opinion
- use new vocabulary
- link cause and effect
- make inferences
- draw conclusions
- generate questions
- summarize
- recognize patterns

In addition, because notebooks can be used successfully with students of every age and ability—including English Language Learners—they are a means for ALL students to work at their level and to grow. In today’s diverse classrooms with their mixed ability levels, science notebooks allow every student to construct and communicate conceptual understanding.

Science Notebooks Help Teachers

Student work in a science notebook is similar to a scientist’s rough draft—handwritten, imperfect, and recorded in methods and formats that the student chooses. Even so, notebooks reveal how much and how well students understand and can apply science learning. Therefore, regular review of science notebooks helps teachers in two important ways.

1. Guidance in Shaping Instruction Access to student thinking through notebooks informs teachers about the effectiveness of their instructional practices. Notebook insights help teachers amend and extend instruction so that students learn. Flexible teachers can learn alongside their students.

2. An Opportunity for Formative Assessment Formative assessment is assessment done *within* instruction as opposed to after or at the conclusion of instruction. Regular monitoring of student notebooks provides rich formative assessment data. The notebooks are diagnostic tools for identifying student strengths and weaknesses. They are also the context for remedy: the kind of ongoing, interactive feedback that students need in order to improve achievement.

In addition, notebooks are an excellent resource for demonstrating progress to parents.