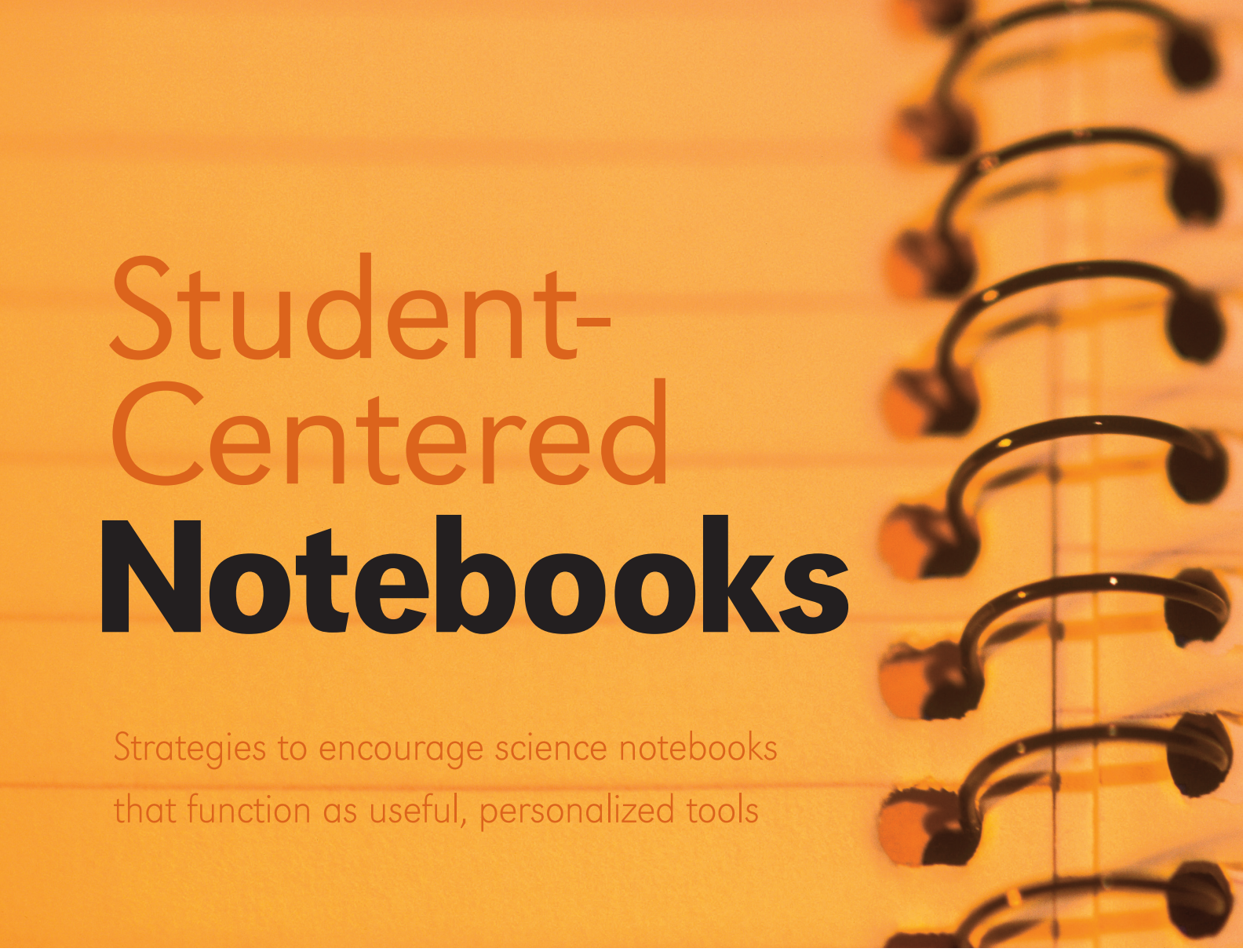


Student-Centered Notebooks

Strategies to encourage science notebooks that function as useful, personalized tools

Science notebooks are fixtures in many science classrooms, but are students using them to their full potential? Ideally, science notebooks should be tools for students to grapple with scientific concepts and make sense of their understandings using recording and organizing strategies that are personally meaningful.

Many times, however, students look to the teacher for what should be recorded in the notebook rather than to their own inquiries and their own experiences with the materials. When looking to the teacher for answers, students are not seeing the notebook as a tool for themselves but rather as an assignment for the teacher. Instead of using the notebook to help them make sense of the content, students are trying to determine what it is they believe the teacher wants them to have in their notebooks. However, if students have personal ownership of their notebooks, they can begin to truly see them as useful tools.

In this article, we explore the idea of developing student-centered notebooks based on our classroom observations and experiences. While developing such notebooks takes time and planning to pull together and maintain, the rewards for students and teachers are well worth it.

By Lori Fulton and Brian Campbell

Making Time for Notebooks

Careful planning will ensure that students develop meaningful notebook entries. When determining the most appropriate use of notebooks for a specific lesson, it is important to have two complementary goals for each science lesson—one focused on content, such as the structure of seeds, and another focused on the recording strategies used in the notebook itself, such as technical drawing. After students have had experiences focused on the seeds, the discussions can then focus on how to represent all of those structures through drawings that can be labeled and referred to later, a notebook goal.

Before beginning a science experience, students need time to think about what they are trying to find out and how they will organize this information. Facilitate a discussion by asking, "As we look closer at our sprouting seed, how might you record what you notice?" Students may benefit from sharing recording strategies (such as using a list, creating a table, or drawing pictures) with one another and thinking about what will be important to record. By setting up this discussion, an environment is created in which students determine their own strategies.

During the science activity, plan time for students to record their findings. For some students, this will be a natural part of their work, while others will need specific time to stop and record their thinking. While it is tempting to have students record in a predetermined manner, it is important to let them select their own method of organization. Not only does this allow students to use methods that they fully understand but it also provides the teacher with information about what strategies students are most comfortable with.

As students conduct the activity, observe the notebook strategies each student is using and then use this information to guide future instruction. For example, if students are recording using complete sentences, future instruction may include a minilesson on technical drawing or using a list to record information. Students also need time to try out new ideas and to talk specifically about the strategies they are using in their notebooks, just as they need time to discuss the content they are learning.

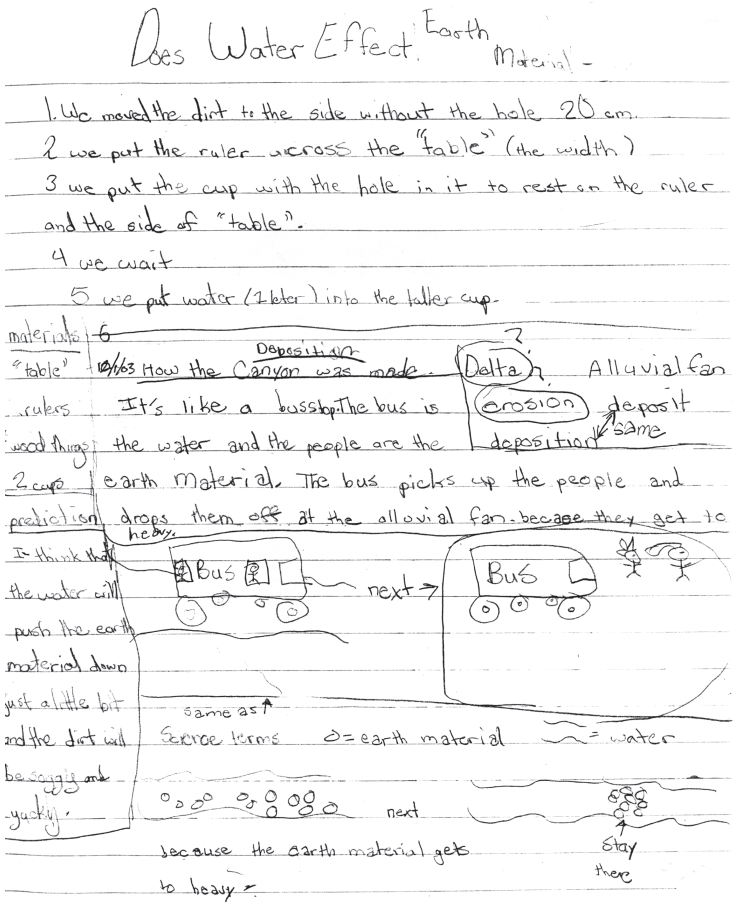
To structure this, ask students to share (with a partner or the whole group) specific ways they are organizing their information or the type of data they are including, such as using different colored pens to record data on different organisms or a t-chart to compare two different environments. This builds in the opportunity for students to talk with one another and learn from one another rather than always relying on the teacher.

After the experience, students need opportunities to refer to their notebooks in order to understand how they can better organize and represent the information. This can be done through discussion or a written assignment. Or, ask students to use their notebooks to create a slide show to represent their understandings, such as plant growth over a few weeks time. Students who have not accurately documented the growth of their plants may struggle with this task and realize the importance of using their notebooks during an investigation. Using the notebook in this manner is essential, as students use the information within it and understand the importance of documenting their work.

Facilitating Ownership

As you conduct lessons, you may begin to notice unique strategies that students are exploring as they work within their notebooks. Some of these strategies may be efficient, while others may appear more random. These different strategies can become important discussion points that lead to more efficient use of the notebook.

For example, when observing properties of solids, the teacher may notice that several students are writing descriptions of each one in paragraph form. This technique leaves the students with little space to add new



This notebook sample shows a student's recording of what she considers to be important to her investigation.

observations and makes it difficult for comparison of the various solids. However, a few students may have chosen to organize the information for each solid using a table. During a group discussion, attention should be called to the table strategy and students should be prompted to consider how a table might be helpful in this situation.

It is essential to find a balance between giving students control of their notebooks and maintaining the integrity of the scientific concepts and processes with which they are working. It can be difficult to turn over control of the notebooks to students and disconcerting to see "doodles" and what appear to be random thoughts. But, with patience, you may be surprised to find students are actually incorporating important elements—questions, titles, etc.—without prompting and taking risks in the way they organize their thinking and data. Ideally, students will refer to previous experiences in their notebooks and use it in their conversations with one another.

As a facilitator, the teacher monitors student progress and provides more assistance or extended opportunities when students are struggling with content or strategies. Over the course of the year, there are times when students need to be introduced to a strategy, such as a line plot, as it is something with which they are unfamiliar. Many times, other students can serve as resources to introduce and explain certain strategies. At other times, minilessons can be used to explore a new technique for recording; however, it is important for students to incorporate the strategy into their notebooks in a way that makes sense rather than be required to use it at that point.

As the year progresses, students become more comfortable with their notebooks but may need additional guidance to increase their effectiveness. Students need time to explore, revisit, and modify ideas, whether they come from the teacher or other students and to share them with one another. Beyond time, it is also helpful to prompt students to share how they recorded their information and encourage them to share their thinking with purposeful questioning or prompts, such as:

- How could you record this information differently?
- Look back in your notebooks; what strategy did you use the last time we observed an animal? How could you improve your strategy?

By prompting students in this way, you are creating opportunities for them to use the notebook in a meaningful manner and to think about how they might improve upon their recording strategies.

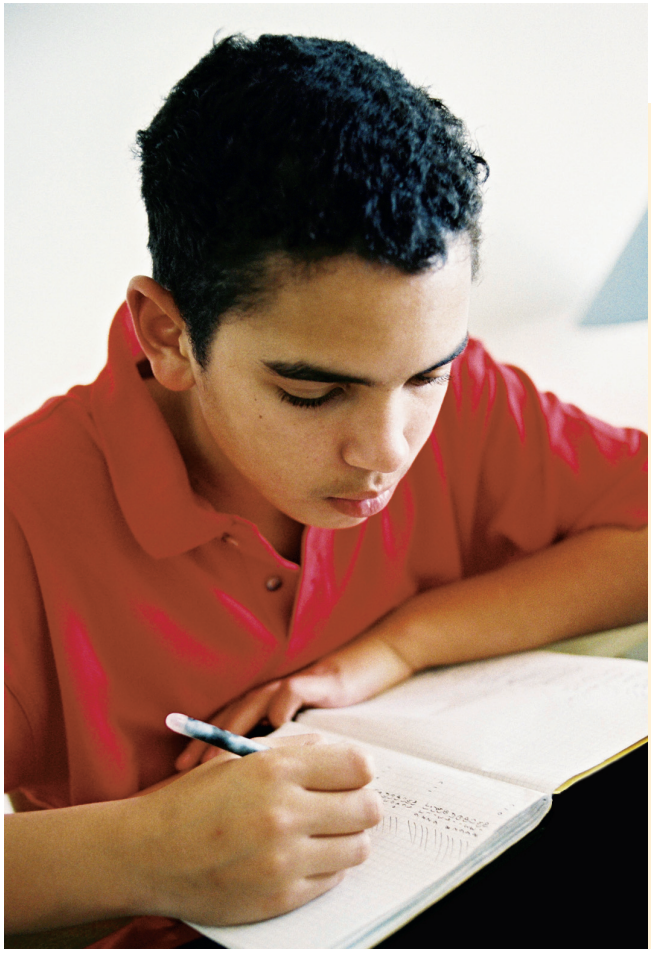


Figure 1.

Student organizational strategies.

- *Technical drawings and diagrams with labels.* These are detailed drawings based on close observation of the structure of the object being observed. They may highlight parts of the object that had previously gone unnoticed.
- *Notes and lists.* These are fragments of students' observations used to record information quickly. They are often useful when observing something that changes rapidly or trying to capture characteristics of an object.
- *Charts, tables, and graphs.* These are organizational tools that provide students with different ways to view data. They may include line plots, t-charts, bar graphs, etc.
- *Written observations.* These are more detailed accounts of observations frequently containing complete sentences. They may contain information that is difficult to communicate in drawings or lists.

Assessing Notebooks

In order to ensure that students' notebooks retell their personal science journey, you may choose not to collect and grade them, so you may need to determine other assessment measures. Before determining how to assess, determine what needs to be assessed: the scientific content or notebook strategies. For example, is the goal to correctly create a two-column list (a notebook strategy) or the goal that students can correctly identify living and nonliving factors (content)? While the two ideas seem simple, the focus for each is different and it is important to separate them for the students during group discussions.

Once you have decided what to assess, determine how to assess it. To gain a better understanding of content knowledge, have students do "quick writes" using their science notebook as a resource. With a quick write, you can specify the purpose and the students know that the teacher is the audience. For example, after working with solutions, the teacher may ask the students to do a quick write on how they would determine the amount of salt that can dissolve in 75 mL of water.

Another method is to listen closely when students share with a partner or a small group. This allows you to learn about the varying levels of student understanding. Whole-group discussions provide another means of gathering information to formatively assess the class as a whole. Again, this should focus on what you have decided to assess, the content or the strategies the students are using. When discussing content, listen to see if students are able to explain specific understandings to determine if they need additional experiences. When discussing notebooks, collect information on the organizational strategies students are using for planning of future minilessons. (See Figure 1 for examples of student organizational strategies.)

For example, as the students are sharing, you may note that several students are using drawings but not labeling them, or that students are recording questions within their observations rather than separating them out. Using these notes, the teacher may have students look at nonfiction texts that use labels or sidebars to show students alternative methods of organizing information.

Finally, students can use their notebooks to create more formal products that they share with others, just as scientists use their notebooks to compile their findings and put together a presentation or a paper. Students can refer to their notebooks as they create slide shows, informational writing, or presentations for class or school science conferences.

In using these other sources for evaluation purposes, the emphasis is that the notebooks serve as records of the students' science experiences. When the teacher does not grade or write in the notebook, the students' focus shifts to what they think is important rather than worrying about what the teacher wants them to include, thus ensuring that the notebook retells the student's personal science journey.

Connecting to the Standards

This article relates to the following *National Science Education Standards* (NRC 1996):

Content Standards

Grades K–4

Standard A: Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

Teaching Standards

Standard A:

Teachers of science guide and facilitate learning.

Standard C:

Teachers of science engage in ongoing assessment of their teaching and of student learning.

Encourage Notebook Use

There are several ways to approach the development of notebooks; teachers need to decide what will best match their approach to teaching science. By releasing control of the notebooks' contents, teachers begin to get a better sense of what their students truly understand in terms of both content and organization. While this may not feel natural in the beginning, it will begin to feel more natural with time, as it is better matched to the student-centered approach of many science curriculums.

By allowing students to take ownership of what information is included and how it is represented in their notebooks, teachers are helping students see the true value of a science notebook—as a tool to assist with their understanding of the concepts and processes of science. ■

Lori Fulton (fultola@interact.ccsd.net) *is a project facilitator with the Mathematics and Science Enhancement project of Clark County School District in Las Vegas, Nevada. Brian Campbell* (bcampbell@interact.ccsd.net) *is a fifth-grade teacher at Lummis Elementary School in Las Vegas, Nevada.*

Resources

National Research Council (NRC). 1996. *National Science Education Standards.* Washington, D.C.: National Academy Press.

NSTA Connection

Science Notebooks: Writing About Inquiry by Brian Campbell and Lori Fulton is reviewed in NSTA Recommends on page 56.