Why Notebooks?

Engaging in active science is one part experience and two parts making sense of the experience. Science notebooks help students with the sense-making part by providing two major benefits: documentation and cognitive engagement.

Benefits to Students

Science notebooks centralize students' data. When data are displayed in functional ways, students can think about the data more effectively. A well-kept notebook is a useful reference document. When students have forgotten a fact or relationship that they learned earlier in their studies, they can look it up. Learning to reference previous discoveries and knowledge structures is important.

Documentation: an organized record. As students become more accomplished at keeping notebooks, their work will become better organized and efficient. Tables, graphs, charts, drawings, and labeled illustrations will become standard means for representing and displaying data. A complete and accurate record of learning allows students to reconstruct the sequence of learning events and relive the experience. Discussions about science among students, students and teachers, or students, teachers, and families, have more meaning when they are supported by authentic documentation in students' notebooks. Questions and ideas generated by experimentation or discussion can be recorded for future investigation.

Once data are recorded and organized in an efficient manner in science notebooks, students can think about the data and draw conclusions about the way the world works. Their data are the raw materials that students use to forge concepts and relationships from their experiences and observations.

Writing stimulates active reasoning. There is a direct relationship between the formation of concepts and the rigors of expressing them in words. Writing requires students to impose discipline on their thoughts. When you ask students to generate derivative products (summary reports, detailed explanations, posters, oral presentations, etc.) as evidence of learning, the process will be much more efficient and meaningful because they have a coherent, detailed notebook for reference.

When students use notebooks as an integral part of their science studies, they think critically about their thinking. This reflective thinking can be encouraged by notebook entries that present opportunities for self- assessment. Self-assessment motivates students to rethink and restate their scientific understanding. Revising their notebook entries helps students clarify their understanding of the science concepts under investigation. By writing explanations, students clarify what they know and expose what they don't know.

Benefits to Teachers

Science instruction is a sequence of conceptually related learning experiences that leads to a set of learning outcomes. A science notebook helps you think about and communicate the conceptual structure of the course you are teaching.

Assessment

From the assessment point of view, a science notebook is a collection of student-generated artifacts that exhibit learning. You can informally assess student skills, such as using charts to record data, in real time while students are working with materials. At other times, you might collect student work samples and review them for insights or errors in conceptual understanding. This valuable information helps you plan the next steps of instruction. Students' data analysis, sense making, and reflection provide a measure of the quality and quantity of student learning. An authentic picture of a student growth. The notebook itself should not be graded, though certain assignments might be graded and placed in the notebook.

Medium for feedback

The science notebook provides an excellent medium for providing feedback to individual students regarding their work. Productive feedback calls for students to read a teacher comment, think about the issue it raises, and act on it. The comment may ask for clarification, an example, additional information, precise vocabulary, or a review of previous work in the notebook. In this way, you can determine whether a problem with the student work relates to a flawed understanding of the science content or a breakdown in communication skills.

Focus for professional discussions

The student notebook also acts as a focal point for discussion about student learning at several levels. First, a student's work can be the subject of a conversation between you and the student. By acting as a critical mentor, you can call attention to ways a student can improve the notebook, and help him or her learn how to use the notebook as a reference. You can also review and discuss the science notebook during family conferences. Science notebooks shared among teachers in a study group or other professional- development environment can effectively demonstrate recording techniques, individual styles, various levels of work quality, and so on. Just as students can learn notebook strategies from one another, teachers can learn notebook skills from one another.

Notes on Notebooks:

- Students' notebooks should include all of the work they complete during a class or for homework.
- Teachers need to provide students with lots of opportunities to illustrate and personalize their notebooks. Encourage students to create interesting, colorful, and fun covers, as well as section/ unit/chapter dividers that illustrate and reflect the course content.
- As teachers review students' notebooks during class time, they should provide feedback to the students, including brief observations and suggestions on sticky-notes.
- Notebook "Did-I Sheets" should also be used by students and teachers to assess and improve students' notebooks on a periodic basis (see example below).
- Notebooks should also be collected on a monthly basis (middle/high school) and weekly (on the elementary level), with feedback again provided through sticky-notes.
- Notebooks should be graded for content, organization, and clarity and the notebook grade should be included as a substantial portion of a student's overall grade.
- Student notebooks are a key indicator of students' and teachers' work and progress. Administrators should examine students' notebooks, and respond to teachers regarding the notebooks, on a regular basis.
- Many teachers require students to keep an up-to-date table of contents at the front of their notebooks, with each page of the notebook paginated. This is a terrific idea if you consistently enforce students' recording of their notebook contents, by page number. If you do not, students will begin to see this, and other portions of the notebook, as optional. Never let this happen!
- Teachers have had success with all kinds of notebooks, including spiral-bound notebooks, hard cover journals, and binders. Teachers should discuss what they will use as a school, department, or grade level team, but not get hung up on which kind of receptacle is the best one. There are pros and cons to each of them.
- Important question: "How do we make sure students always have their notebooks on hand?" There are three solutions that many teachers have found valuable. First, as mentioned above, provide students with lots of opportunities to illustrate and personalize their notebooks. The more students cherish their notebooks as *their* creations, the more they will hold onto them and use them. Second, buy tons of notebooks (or paper for binders) at the beginning of the year, as a school, department, grade level team, or individual, and sell them to students at cost. Many stationery supply chains run August sales that allow teachers to buy notebooks or paper at bargain basement prices that every student can afford. If a student forgets his notebook or binder, sell him another notebook or some paper, let him glue-stick his day's work in his original notebook or add it to his binder, and then leave the second notebook in school for other days when he's forgetful. Finally, make the notebooks an integral part of students' work every day. Having their notebooks on hand will become second nature.