

T'was the **Start** of **Science** **Notebooking**

A poem to celebrate a vital classroom tool

By Beth Leffler and Brenda Crauder



The beauty of science notebooks is that there is not one precise way to create and develop them but a variety of ways that may be adapted to best meet the needs of the individual. We'll guide you with a list of approaches we have successfully implemented to introduce and reinforce science concepts.

T'was the day before school, when all through the night
anticipation was growing, enthusiasm was bright.

Children would arrive with teachers ready to steer,
excitement of things to come this new year.

With me in my lab coat and the kids in school clothes,
we knew in a flash, we'd be nose to nose.

When what to my wondering eyes should appear, but a
science notebook, and the first days with no fear.

The first day arrived, there arose such a clatter of excitement explaining how science notebooks matter.

Away we flew from the title page to content, with reminders of details, how our days would be spent.



With the ideas of science on the notebooks' main cuff, we discussed what science is, and doing cool stuff.

Our thoughts really mattered, which added great fun, as our writing was shared, unique to each one.

Science notebooks are an individual portfolio of a child's development and comprehension over the course of each unit as well as the entire year. Using notebooks reflectively in inquiry learning enables students to review their own ideas about a topic while creating opportunities for teachers to make formative assessments. Teacher reviews of children's development encourage the instruction to be on the level of inquiry that best meets the needs of the individual.

How a notebook is set up has various approaches, from the specific layout of information and materials (content items on the right page and thought-based experiences on the left page), to the approach of recording information with starter sentences or questions. Whatever approach is chosen, be consistent with a defined framework that can be continually modeled to ensure success. When presented with appropriate support, students of various abilities may become engaged with the notebook concept and eager to take ownership.

An initial approach, as one begins to model the concept of science notebooks, may include starting with the general inquiry questions: What is science? What does a scientist look like? This lesson provides insight into student perspectives: What preconceived notions do they have about science? Why do they believe this? Approaches like this are meant to provide students the opportunity to think, record, and share for themselves their views of science. This may provide a model expectation of what the teacher will be looking for throughout the notebook process, along with allowing a continual point of origin as a resource throughout the course of the year. As students record information in their notebooks, both initially and throughout the year, they are invited to share with the class their recordings on science concepts. This allows for an important factor in learning—communication through the expression of one's own ideas within a controlled environment. As a result of collaborative group discussions, along with teacher-directed content focuses, evidence-based conclusions may be reached. This formative assessment of knowledge provides the opportunity for students to learn from one another.

Another approach may be to invite a scientist from the community to share his or her experience and use of science notebooks. Though the professional may approach their science recording in various ways, the students are often affected by the purpose behind the notebook and how it is used in the real world. These connections can be inspirational and motivating.

Next the wall became our own, so lively and quick, as we shared our responses, our ideas clicked!

More rapid than eagles the childrens' views came, as they wrote and shouted out content by name.

"Now, vocabulary! Now, instruments! Now, lab tools and safety! On details! On drawings, be careful—not hasty!

To the top of the notebooks! To the top of the wall! Now write away! Post away! Share away all!"



A support element to science notebooks can be the creation of “talking walls.” “Talking walls” emerge to tell a story about the various concepts and questions concerning the main idea of the selected topic. Posted at the top of the board is the general focus question: What is science and how is it done? From there the wall can be divided into two parts, one labeled *concept* and the other *question*. On the question side, the students are frequently encouraged to write questions and ideas that they have about the topic on sticky notes or index cards. As questions are answered with evidence from external sources such as journals, labs, and interviews, they can move to the concept side. A companion of the inquiry questions may be a “word wall” of science vocabulary, pictures, class notes, materials used, examples of in-class experiments, and fun facts discovered along the way. The students may choose to construct the wall as they go.

The students/teachers may decide to save the questions at the end of each unit to develop a science inquiry bank for students to reference when they want to expand their knowledge.

Formative assessments may be implemented through the use of an exit slip. Exit slips can be used to ask students to briefly explain a concept, define a vocabulary term, make a prediction, or provide evidence to support a claim—anything based on their notebook work for the day. Each student responds with a concise answer, providing the teacher with a snapshot of their notebook entries and individual comprehension.



And then, in a twinkling, I heard the children shout, ways to perform science—what it's all about.

“Scientific processes; there are so many ways; from inquiry to methods to be used each day.”

Educators continually need to remind children that there are various approaches to understanding science, from basic questioning, research, ideas, and experiments to specific step-by-step processes. This is the time to set high expectations as an instructor and model a variety of ways that science can be investigated.

When the students grasp the expectations set by the teacher, together they create a rubric for the science notebooks and lab work. The rubric is developed using a simple scale, allowing students to incorporate ideas such as fun titles and examples of what each category would look like. These rubrics may also serve as a self-assessment and/or teacher review. While sharing and monitoring students' work, remember that the science notebook is their personal space to share content knowledge. An important component in notebooking is allowing the students to make adjustments and further develop ideas based on their reflections and interactive discussions. Creating this awareness may lead them to understand that science can often turn the greatest “mistakes” into “success.” Therefore, mistakes are welcome opportunities to learn and grow. Students are encouraged to continually build upon items in the notebook, not erase or tear them out.



Kids dressed for safety, from their head to their toe. “Make Safety First” was their daily motto.

A bundle of materials were placed on a tray, to organize the students as they went on their way.



Their eyes how they twinkled! Their voices so merry! They were enjoying themselves, and assessments—that’s scary!

Their detailed notebooks were drawn up with great care, discussions, new ideas—never were rare.



Define the key safety elements that children need to know. Build on real world connections by showing safety symbols that are used in classroom labs and within the community. An approach may be to have the students list safety features that are important and record these concepts. Safety concepts may be placed in the back of the notebook. One feature used for this purpose is the flipped notebook. Flipping or turning the notebook around and approaching it from the back allows the students to create a “Content of Safety Features” used throughout the year. References to this section of the notebook before doing labs can often reinforce the importance of safety features.

Notebooking is one of the processes that can empower children to gain confidence and a deeper understanding in various fields of science. Their recorded portfolio of work allows students and teachers to assess frequently and share concepts clearly with others. A notebook check is vital, especially in the early stages, to establish a systematic process. This assessment tool, however, is not to be used to check for accurate grammar and spelling, or as a critique of individual thoughts. Open forum discussions and pieces published outside the notebook can allow for altering assessments when criteria and purpose are logically defined. Science notebooks need to be used to monitor students’ understanding but should not be the grade for their comprehension. An example of assessments for a three-week unit may be the following:

Formative assessments: Teacher observations, pre-assessment, student/teacher-created rubrics on notebook content (both self-assessed and teacher-assessed), exit slips on daily topics, and two teacher notebook reviews.

Summative assessments: Key published piece from the unit (This varies but may include a lab review, line of learning conclusion, science article critique, or research finding); and one final assessment of standards (These may include or combine an inquiry project, open-ended questions aided by the notebook, a standards-based test, or a culminating lab).

The nongraded assessments support the teacher and students’ personal understanding of skills. The graded items reflect the level of mastery of the targeted standards.

The mind of a child is curious and strong; Lead them not to worry, 'bout being right or wrong.

Explore their ideas, share with one another, science is exploring and working together.

Their notebooks were filled, looking chubby and plump, From graphs, from labs, they couldn't be stumped!

A quick little look at the work that lies ahead soon let me know I had nothing to dread.

Children are naturally curious about their world. Fostering this curiosity through the use of inquiry may allow students to delve deeper into the content area through the use of creative problem solving and critical thinking. Often as students transition through school, they become more concerned about their ideas being right or wrong than in developing their personal views. This is where their notebooks can provide them with a voice. A voice that allows them to ask questions and share their insights. When used properly, science notebooks are a successful means to developing a world of problem solvers and critical thinkers. Students take pride in themselves and their true abilities as scientists.

The students' conceptual framework may be supported through the inquiry exploration of STEM concepts in their notebooks while enhancing the rigor and relevancy of science in their everyday lives. Science notebooking is the success story of every emerging scientist. ■



"Science is fun!" they shouted with glee, "Our responses are our own and we share fully!"

The notebooks are merry, they make students bright. We can plan and play hard; science is out of sight!

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Connecting to the Standards

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

Content Standards

Grades K–8

Standard A: Science as Inquiry

- Abilities necessary to do scientific inquiry National Research Council (NRC). 1996. *National science education standards*. Washington, DC: National Academies Press.