

Science interactive notebooks in the classroom

Writing is one of the ways that children learn in science...When students explain what they have seen and why they think this occurs in writing, they are forced to clarify their thoughts and organize these ideas in a way that others can understand (Azimioara, Bletterman, and Romero n.d.).

Science interactive notebooks are a tool used to strengthen student learning of curriculum (the input) through increased student participation (the output). They can be used in class daily to promote student learning and prove to be successful because they use both the right- and left-brain hemispheres to help sort, categorize, and implement the new knowledge creatively. The right side of the spiral notebook is for writing down information given by the teacher (notes, vocabulary, video notes, labs, etc.). The left side of the spiral shows the processing of the information from the right side (brainstorming, reflections, drawings/figures, worksheets, etc.).

Science interactive notebooks are important for many reasons. By using notebooks, students model one of the most vital and enduring functions of scientists in all disciplines—recording information, figures, and data. A second reason for maintaining a science interactive notebook is that it provides a ready reference for each unit, as well as a resource to consult for review. The notebook is also a means of communicating with the teacher and parents/guardians. Keeping a notebook also enhances students' writing skills, therefore connecting science with other areas of the curriculum. Extensions in the notebook can include poems, cartoon drawings, figure drawings, stories, songs, and notes from research on any given topic.

Lastly, the science notebook offers the teacher a unique means of assessing student progress in the classroom. The notebook, beginning with the first lesson of the unit and continuing to its conclusion, can be used to assess the growth in students' understanding as well as their ability to summarize and express their thoughts and feelings. Think as a scientist ... record as a scientist ... and reflect as a scientist!

Getting set up

A spiral-bound (200 pg.) or a large-size composition book should be used. These notebooks with hard or plastic covers seem to be the most durable and can last for at least one semester. The key is to not have the students



rip out or add any pages. However, papers are periodically glued into the notebook.

Require that all the students in the class organize their notebooks in the same manner, using the right side for input (lectures, labs) and the left side for output (drawings, reflections, worksheets) Each student should have the same thing on each page of the notebook (see Figure 2). A rubric glued into the front of the notebook will inform students and parents on how the notebook will be scored. Information as to what goes where (left side versus right side) can also be glued in the front of the notebook. A table of contents can be glued in at the beginning of each unit or after a few units, or the teacher may choose to have the students construct the table of contents. Students should always date their entries and number the pages consecutively throughout the entire notebook.

The writing habit

Students who have not used science interactive notebooks previously may need initial guidance on how to use them most effectively. A good way to begin is by facilitating a brainstorming session designed to increase students' awareness of the importance of maintaining a notebook. We brainstorm on "how will notebooks help us learn the course material and organize ourselves," then

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review the guidelines on the reference pages glued into the front of their notebooks.

It is helpful to encourage the students' understanding of their notebooks in two major ways. First, they should "take notes" on information they have been given. As they move through the daily lessons, students should also "make notes"—that is, ask questions, sketch, and record comments. Emphasize the importance of always writing clearly and of expressing thoughts in an organized way. Encourage students to incorporate tables, graphs, figures, and diagrams as much as possible. The left third of each page is used for study questions to be completed when appropriate; the right two thirds is used for note taking during class.

Providing daily notebook writing time can be challenging. With proper planning, however, writing becomes a natural part of the rhythm of the

science class. It does not require a complete overhaul of previous lesson plans. Everything the teacher has been doing in the classroom previously stays the same—sim-

FIGURE 1 Student objectives

After sufficient practice, students who keep science notebooks should be able to do the following:

- Increase their understanding of science concepts based on the standards for each grade level.
- Use writing as a process for discovery.
- Improve their ability to organize ideas and information.
- Recognize the connection between thinking and writing.
- Write more freely, more comfortably, and more often.

ADAPTED FROM "WRITING FOR UNDERSTANDING" IN SCIENCE AND WRITING CONNECTIONS

FIGURE 2 Science interactive notebooks

Left side

The left spiral page demonstrates your understanding of the information from the right side page. You work with the input, and INTERACT with the information in creative, unique, and individual ways. The left side helps focus your attention and guides your learning of the science content and concepts.

What goes on the left side?

Output goes on the left side!

- Every left side page gets used!
- Always use color and organize information...It helps the brain learn

What could go on the left side?

- Brainstorming
- Concept maps
- Pictures
- Diagrams
- Flow charts
- Poems
- Worksheets
- Mind maps
- Venn diagrams
- Drawings
- Writing prompts
- Lab and self reflections
- Songs

Right side

Science interactive notebooks are used to help you learn and remember important scientific concepts. Why do they work? This notebook style uses both the right and left-brain hemispheres to help you sort, categorize, remember, and creatively interact with the new knowledge you are gaining.

What goes on the right side?

Input goes on the right side!

- Always write the date on each page and label each assignment!

Guidelines:

- The right side spiral has only odd numbered pages.
- The right spiral page is for writing down information you are given in class (input).
- When the teacher lectures, you take notes on the right side.
- When you take book notes or video notes they ALWAYS go on the right side.
- You may use Cornell Style Notes on the right page.
- Laboratory activities go on the right side. Any other type of INPUT you get in class.

ply adjust the curriculum to fit into a notebook and add some writing pieces. Integrating the notebook does not take large amounts of extra time and, after the initial year, planning for subsequent years will be easier.

Incorporating writing time depends on the nature of the classroom activity on any given day. What is most important is that students have sufficient time and opportunity to write each day. Worksheets, demonstrations, lectures, lab activities, and figure analyses are all examples of possible daily entries into the science interac-

tive notebook. During some labs or activities, things may go more smoothly if students suspend their hands-on investigations at certain points, reflect on the activity, write in the notebook, and then resume their activity. In other cases, the best time to write is after the activity or lab ends. Even though students have used their notebooks repeatedly during a lesson, a few minutes should always be left at the end of a lesson for students to reflect and write on what they have learned and to address questions that have arisen. Guided reflection can

take a number of forms to focus the students learning. Lab reflections can be done after each laboratory experience and self-reflections are done at the end of each unit so students can think about the chapters covered.

Assessing the notebooks

Explain to the students early on that when the notebooks are reviewed many things will be considered. These should include how complete the entries are and how much effort has been put into the writing, effort being completion and thoroughness. Students should think of the information in their notebooks as a work in progress, however, that does not excuse messiness, a lack of readability, or grammar and spelling errors. Teachers should emphasize writing across the curriculum. What the student learns in English and math also goes for science. The teacher should sit down with a language arts teacher and review what is expected of each grade level in their writing classes, so the science teacher can incorporate the same basic requirements. If each teacher requires something different, students will get confused.

It is essential to check the students' notebooks often. A glance at the notebooks during class, and collection of them on the day of a unit test for a more detailed review, should provide sufficient evaluation. Feedback may be given to students in many ways. Some teachers prefer to use sticky notes, while others write on the notebook page itself. Some may pre-

FIGURE 1 Science interactive notebook rubric

6	<ul style="list-style-type: none"> • Notebook contents are complete, dated, and labeled • Pages are numbered (odd: right-side; even: left-side) • Right-side/Left-side topics are correct and contents organized • Lecture notes go beyond basic requirements • Uses color and effective diagrams • Shows impressive, in-depth self-reflections
5	<ul style="list-style-type: none"> • Notebook contents are complete, dated, and labeled • Pages are numbered (odd: right-side; even: left-side) • Right-side/Left-side topics are correct and contents organized • Includes most of the traits of a "6", but lacks excellence in all areas • Most areas meet requirements but don't go beyond • Shows in-depth self-reflection
4	<ul style="list-style-type: none"> • Notebook contents are complete (at least 90%), dated and labeled • Pages are numbered (odd: right-side; even: left-side) • Right-side/Left-side topics are correct and contents organized • Uses color and some diagrams • Information shows basic understanding of content topics • Some areas meet requirements, but don't go beyond • Shows limited but real self-reflection
3	<ul style="list-style-type: none"> • Notebook contents are complete (at least 80%), dated and labeled • Pages are numbered (odd: right-side; even: left-side) • Right-side/Left-side topics are somewhat organized • Uses minimal color and few diagrams • Information shows a limited understanding of content topics • Few areas meet all requirements • Shows some real self-reflection
2	<ul style="list-style-type: none"> • Notebook contents are incomplete • Some attempt at dating and labeling of entries is made • Right-side/Left-side is inconsistent and contents are unorganized • Information and concepts show only a superficial understanding of the subject matter and/or show serious inaccuracies • Notebook is not neatly written • Shows little real self-reflection
1	<ul style="list-style-type: none"> • Notebook turned in, but too incomplete to score

fer to enter their comments in the back of the book or on the table of contents. Also, at the end of each unit the student is required to have their parent/guardian review their work and sign their notebook. Incorporating the parents/guardians into the curriculum to evaluate the students' learning progress allows critical communication to occur and for the parent to review the work before a grade is assigned.

Feedback should be positive and constructive. Grade students on completeness and effort. When scoring, include any homework assignments in the notebook. Using a clear scoring rubric enables the students to understand how they can improve. Rubrics can be created on a general basis or may be specific for a particular assignment or entry. Make the assessment simple to facilitate grading all the notebooks in a timely manner and enable the students to better understand what is expected of them.

Conclusion

Science interactive notebooks fill many roles. They promote students' science learning and give students an opportunity to enhance their writing skills. They help students better appreciate the process of scientific inquiry. They help students organize their learning and, by the end of the unit, realize how much they have learned. For teachers, the interactive notebook is a unique means of assessing student learning and organization.

These guidelines emphasize the many benefits that science interactive notebooks bring to the classroom. The notebooks can transform classrooms into dynamic learning environments. In the process, students connect their prior experience with new material and learn to acquire knowledge in ways that will make them life-long learners. ■

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