A Personal Memory of Learning:
Sense-Making Notebooks

(Editor’s note: Science and Mathematics Notebooks have many purposes. The K-12 Alliance is searching for ways to make writing in notebooks a link to high quality student learning.

This is the first in a series of articles designed to explore: what is critical in notebook strategies that make the notebook a sense-making document for student learning; how to select types of entries that are purposeful for increasing student understanding; and to incorporate metacognitive strategies that help students know what they know and identify what they don’t know or questions they need to answer, how teachers can scaffold strategies to move students toward productive thinking; and finally, sample student work entries that show how they are making sense of information.)

Many science teachers require students to keep a notebook. Mathematics teachers have the same practice and often call the product a journal. Some notebooks/journals are a collection of assignments, while others have lab sheets or math pages glued into a spiral bound notebook. Some notebooks have drawings with labels and student reflections, while others are filled with procedures, problems, data tables with summaries and conclusions.

But the overall question is, “What is the importance of this notebook to the student?” Is the notebook merely a collection of entries valued by the teacher or is the notebook a glimpse into the mind of the student? Is the notebook a place for the student to record data and ideas plus process the information in a way that makes sense to the student? K-12 Alliance notebooks have the challenge of: “How do we develop sense-making notebooks that allows the following reflection?”

Writing slows down and focuses my thinking; I am able to hear each word in my head and see it on paper. It is like a mindful meditation during which I shut out the rest of the world and am totally engaged in the process. Writing allows the page to become a holding place for our thoughts until we can build upon them.

— Cynthia Tufts, Literacy Strategies for Improving Mathematics Instruction, 2005

When first working with students on notebooking, it is easy to be consumed by format. In our opinion, sense-making notebooks/journals do not include a “right way” for formatting or organization. We encourage teachers to select the format and organizational tools that work best in their classrooms. We are more concerned about how students use their notebook entries for sense-making.

In order to think about student sense-making or processing information, think about entries that you make as an adult after attending a presentation, workshop or seminar. Did you take notes? doodle? drew pictures? make graphic organizers? Have you ever re-read your college notes? As you turn those pages, what do you recall from the class? Often, your notes were your personal history/memory of what you were learning.

We process information in different ways, ways that make sense of the information so we can incorporate that information into our life, either personally or professionally. All the notes, tables and drawings we made were our way of making sense of the content and helped our understanding of how that learning fit into our daily life.

Sense-Making Notebooks of the Masters

Even more compelling is looking at notebooks of some of the most famous historical scientists and mathematicians, such as Darwin, Galileo and Einstein containing entries as varied as the individually.

Einstein’s notebook is filled with some of which have been crossed out; Darwin’s has sketches, branching trees and many personal thoughts and wonderings. One evident theme in these notebooks is the author’s sense-making strategies such as edited writings, cross-out sections, arrows linking sections, drawings, summary statements, notes of what the author knows and what he/she is thinking about, evidence that pages and thoughts have been cross-referenced.

The message is clear. In order for notebooks to be relevant to student thinking and understanding, students need to do something with their entries. Recording information is not enough. Notebooks need to help students process their understanding.

The intuitive sense that notebooking is a personal experience and more than a place to keep papers, is reinforced by an article from the November/December 2005, NSTA Science and Children magazine. Joan Gilbert and Marleen Kotelman delineate five good reasons to use Science Notebooks.

1. Notebooks are thinking tools. Notebooks offer students opportunities to construct conceptual meaning and understanding of the content. By recording their thoughts, recording data during an investigation, making drawings, making graphic organizers, having time to thoughtfully review and analyze their entries, students can make sense of the science they are learning.

2. Notebooks guide teacher instruction. Opening a student’s sense-making notebook offers a teacher a “snack peek” into the student’s brain. It is an opportunity to see how the student is analyzing the data and making connections to other data kept in the notebook, which can provide the teacher with insights for “next steps” in instruction.

3. Notebooks enhance literacy skills. Notebooks provide students with many opportunities to use various forms of expository writing such as descriptive, procedural, narrative, explanatory and persuasive. This practice and the skills developed transfers to writing in other subject areas.

4. Notebooks support differentiated learning. Notebooks offer students at various ability levels to record their data and thoughts in the manner that makes sense to them. Students who are struggling with English, can record in their notebooks in their primary language.

5. Notebooks foster teacher collaboration. Teachers can use notebooks as a basis for study groups or professional learning communities. By viewing one another’s notebooks, teachers are able to build on one another’s success and sharing strategies provides a wider repertoire of successful notebook strategies to use with students.

If we consider what we know about how people learn (Bransford, 2000),
NOTEBOOKS... CONTINUED FROM PAGE 1

2009 is the year of science – for building public understanding, for rethinking science education in California (as the science framework committee meets) and for beginning STEM initiatives to think about ways to make learning relevant to 21st century students and ways to make the U.S. competitive in the world market.

As the K-12 Alliance begins its 24th year, we are eager to help schools design and implement quality science programs which can address the needs of all students. Our emphasis this year is on sense-making notebooks as a means to improve science understanding and build language arts skills.

We also are increasing our attention to the needs of ELD students. Gloria Banuelos (see Leadership Column, page 3) has joined our organization as a Regional Director and will assist us in this direction. Our CPEC work in Montebello uses ELD time for teaching science and integrates the use of the SE lesson design with language level appropriate student response.

Quality teaching and learning goes hand and hand – we will continue to share information that forms instructional decisions which enhances both teacher skills and student learning.

To this end, I would like to share the findings of a new report. Exploring What Works in Science Instruction: A Look at the Eighth-Grade Science Classroom, written by Henry Braun, Richard Coley, Yue Jia and Catherine Tra, analyzes data from the National Assessment of Educational Progress (NAEP) to identify aspects of U.S. eighth grade science classrooms that appear to make a difference in students’ science scores. The authors examine student and teacher characteristics along with teachers’ instructional strategies. Which are effective? Which need revisions? Which need to be tossed and replaced with strategies that match the needs of your students?

Remember, we are here to help one another reach our highest level of achievement so that we, in turn, can help students reach theirs. Our success means they can succeed.

Good wishes for a great new school year!
Cultivating leaders in science education is a basic premise of the K-12 Alliance. Everyone has the potential to become a leader, given the opportunity to learn, practice and evaluate core leadership principles. During its life-span, the K-12 Alliance has helped hundreds of individuals cultivate their leadership abilities in a safe and nurturing environment. The pathway to being a leader is intellectually stimulating, emotionally invigorating, and physically demanding – no one said being a leader was easy!

My name is Gloria Rodriguez Bañuelos, Ph.D. and I am the newest Regional Director. Unlike many of you, I did not start as a K-12 Alliance teacher who moved through the ranks to become a teacher leader (staff developer). Before March of this year, I had never heard of the K-12 Alliance, yet I have been given the opportunity to lead. This action speaks to the K-12 Alliance’s commitment to diversity of perspectives and inclusiveness of individuals with different experiences.

As a native speaker of Spanish, born of immigrant parents in California, I have experienced firsthand the challenges faced by English learners and their families as they seek to access quality science education programs. As a teacher, I personally discovered the unique dual language development was an integral part of every activity. The pathway to being a leader is intellectually stimulating, emotionally invigorating, and physically demanding – no one said being a leader was easy!

Opportunity to Lead

BY GLORIA RODRIGUEZ BAÑUELOS

The Good Questions

BY DAVID HARRIS

Environmental Partners

BY CHRISTIANE A. MAERTENS

PARADING BY – Students of John Muir Elementary School — and winners of last year’s Disney’s Environmentality Challenge — got their day in the sun at Disneyland.

To further support the program, Disney is developing an entirely new and interactive website that kids and teachers will find exciting as well as a great resource for their projects. In addition, teachers and students now have the ability to create and submit their portfolios in an environmentally friendly digital format.

The K-12 Alliance will play a crucial role in the launch of the national program, which begins in 2010, by assisting with the development of lesson plans for classrooms in all 50 states and ensuring that Curriculum Standards are met in each location.

In addition, the K-12 Alliance will help develop the strategy for a national evaluation process for classroom projects and help cultivate a partnership with the National Science Teachers Association (NSTA) to further enhance the study of our interaction with science and nature.

Disney is eager to expand its program across the nation as well as its relationship with the K-12 Alliance and looks forward to a new connection with the NSTA. The task is enormous and these partnerships are a critical element to the growth and success of the new Disney Planet Challenge.

We are excited to bring a program that encourages quality science education to students, not just in California, but the whole United States!

Christiane A. Maertens is the Manager of Environmental Affairs for the Walt Disney Company.
Summer Institutes: Fun and Learning… Together at Last!

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fter an energizing week, the teachers were ready to practice what they learned this year in their TLCs! Summer Institutes: Four what’s the big idea? Fun and Learning… California gave up a portion of their well-deserved vacation opportunities offered to these dedicated teachers. Institute discuss with gusto. HARD AT WORK — Participants from Lake Elsinore School District met for two weeks of intense content and pedagogy professional development in science, the second year of this CPEC funded partnership. Teachers learned new ideas and left energized to questioning their content knowledge as learners and questioning strategies learned during the institute. The summer institute will be followed by school year meetings focused on student lessons. Escondido: Escondido Union School District held a four day Summer Math Institute in August where fourth and fifth grade teachers had a great time with math activities to increase knowledge about algebra and problem solving. They had even more fun planning lessons for the fall using conceptual flows and questioning strategies learned during the institute. These planning teams will continue throughout the year as part of EUSD’s commitment to increased collaboration in mathematics instruction. As you can see, the learning was abundant! Next year, we hope you join us!

Shasta: Held in August, the Shasta County Math Partnership welcomed 56 teachers (from third grade through Algebra II) to the 30-hour mathematics event which covered operations and conversion of decimals, rationals as rational numbers, irrational numbers and numbers in nature. In addition, NASA presented its impressive FlyBy Math and Smart Skies simulations. Overall, the weeklong institute delved into math content, modeled hands-on student activities and offered instructional strategies using small and large group inquiry-based lessons, cross-grade level discussions, demonstrations and presentations.

Kelseyville: The LARE Science Collaborative focused on physical science in a weeklong Summer Institute. The Content Cadre – made up of university professors, middle and high school science teachers and a science educator who is a nature reserve keeper – kept teachers motivated with hands-on and minds-on standards-based science topics for grades 4 through 6. Topics included electricity and magnetism, chemical reactions, properties of salts, separation of mixtures, renewable/non renewable resources, and heat transfer. Teachers practiced using science notebooks and accountable talk throughout the week and were eager to include these strategies in their TLCs in the fall and spring.

Kings Canyon: The days were incredibly hot in the Central Valley yet the 60 Kings Canyon/Sanger teachers were delighted to learn content in the coolness of the Kings Canyon/Sequoia Forest. Field trips along the Kings River focused on the magnificent geology and botany of the Sierras. Physical science teachers visited a wastewater treatment plant to learn methods of cleaning water so it could be available for other uses.

Other highlights of the week included content information on Ecosystems, Rock Processes and the Properties of Matter. The institute had representatives from the K-12 Alliance, CSU Fresno, Fresno City College, CSU Long Beach, Kings Canyon Unified School District and Sanger Unified School District.

Montebello/Garvey: Eighty teachers from Montebello Unified School District and Garvey School District met for two weeks of intense content and pedagogy/ professional development in science, the second year of this CPEC funded partnership. Teachers learned new ideas about how to integrate ELD strategies with science instruction.

This partnership includes CSULB, CSUDH and CSULA faculty, who provided science instruction and the latest research on ELD strategies. Participating teachers will continue their summer work through the TLCs during the school year.

Pasadena: For the third year of the Pasadena Pipeline, 40 teachers from Pasadena Unified School District met for eight days of intense content and pedagogy professional development in mathematics. Teachers learned new ideas and left energized to teach mathematics in the coming school year.

Under the guidance of cadre members – which included representatives from California State Polytechnic University, Pomona and the K-12 Alliance/ WestED along with five district coaches – participants stretched their thinking about their teaching practices by questioning their content knowledge as learners and as teachers.

The Pasadena Pipeline is one of California Mathematics Science Partnerships (CaMSP). Participating teachers will continue their summer work through TLCs during the school year.

Coachella: Coachella kicked off the new CaMSP project Students Understanding Mathematics targeting grades 3 through 6. The temperature was very hot, the teachers’ enthusiasm for the new project made each day very cool!

Seventy teachers representing Coachella Valley Unified School District, spent eight days engaged in learning math content and pedagogy. This is year one of a three-year effort to increase student learning in mathematics. Teachers are developing collaborative teams both at their grade level and across grade levels in order to meet the needs of the local population. The summer institute will be followed by school year meetings focused on student lessons.

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THE GOOD QUESTIONS... CONTINUED FROM PAGE 3

that set shows understanding. In the end, students who are allowed to come to conclusions in this manner mean they will view questions with a refreshed eagerness, and not just merely situations for dull memorization. This is learning in the real world.

David Harris is a Teacher on Special Assignment with the Escondido School District. He is also a Regional Director.

Being in K-12 Alliance is like being at summer camp because the camp counselors are too cheery in the morning, camp is so fun that you don’t want to (and can’t) leave, unstructured time is non-existent, camp counselors have happy hour while student are still in class, and there’s a dance on Friday.

Being in K-12 Alliance is like doing shots because...at first you are nervous, your don’t want to do it alone, after a few, you start to relax, you start talking louder, you become more colorful, but when you’re done, you pass out.

Being in K-12 Alliance is like being at Sea World because we are trained to perform and we respond well to snacks.