

Things That Matter

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 5E lesson design with language level appropriate student response.

Quality teaching and learning goes hand and hand – we will continue to share information that informs 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 Trapani, 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, and describe how these teacher practices vary across different types of U.S. schools.

The study identified several instructional strategies that are linked with higher science scores:

- students doing hands-on science activities
- students talking about measurements and results from hands-on activities
- students writing long answers to science test questions and assessments
- students working with others on a science activity or project



- students reading a science textbook

Some other instructional strategies were found to increase science achievement when used in moderation:

- students taking a science test
- teacher doing a science demonstration
- students discussing science in the news
- students reading a book or magazine about science
- students preparing a written science report

Finally, two teacher practices were negatively related to students' science scores — that is, the more they are used, the less likely the students are to do well in science:

- students giving an oral science report
- students using library resources for science

The authors examined many strategies that were effective for all students; several were identified that could help close the achievement gap. For example, two effective practices — teachers doing science demonstrations and students discussing science in the news — were less likely to be used for minority students. Therefore, increasing the use of these practices among minority students might help close the achievement gap.

On the other hand, one negative practice — students giving an oral science report — was more likely to occur in more disadvantaged schools.

Thus, curtailing this practice in such schools may pay dividends in closing the achievement gap.

Download this report at www.ets.org/portal/site/ets/menuitem. It should stimulate discussions on how instructional practices are implemented in classrooms and the ways they are used.

As you begin this school year, think about your 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! ■

NOTEBOOKS..., CONTINUED FROM PAGE 1

et al., 1999) we are reminded of the importance of metacognition (reflection) in the learning process. Notebooks offer prime opportunities for this type of reflection when prompts or activities move from copying isolated entries to linking entries through notes, summaries, arrows or even crossing things out. The simple message is from the masters: Notebooks are learning tools not a file cabinet.

Sense-making notebooks provide prompts that offer students opportunities to focus on “What do I know so far?” “What other factors should I consider?” “What other solutions might work?” “What am I still not sure about?” These types of reflections promote and clarify learning.

To help students become metacognitive, teachers often have to scaffold student thinking. This can be accomplished by asking students a variety of questions, by having student make various entries (e.g., charts, tables, maps, sentence stems or organizers), and by providing prompts that cause students to stop periodically in an investigation and reflect on their thinking. Scaffolds may be needed for a period of time but the purposeful removal of scaffolds eventually leads to greater student thinking.

There are no magic bullets for actualizing sense-making notebooks. However, if you are willing to make the effort, you can see dramatic improvement in student work and thinking.

Reflect on your practice. Think about ways you can help your students move from “less of” to “more

of” as indicated in the chart below.

Less of:	More of:
Copying notes	Student completes open-ended frames
Graphics set up by the teacher	Student organizes information on a graphic
Math problems where student shows work	Math problems where student shows multiple ways to solve a problem
A collection of isolated papers/assignments	A collection of assignments with reflections
Student's check off completion	Student's check off how confident they are in the response: green/got it, yellow/not sure but may have it, red/need help.
No evidence student uses notebook as a reference	Notebook is a reference as indicated by arrows, page numbers, citations used as evidence

Throughout this school year and upcoming newsletters, we'll share efforts, samples of student work, and best practices for encouraging student thinking in notebooks. The journey promises to be a true community of learners about notebook use. Stay tuned! ■



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Opportunity to Lead

BY GLORIA RODRIGUEZ BAÑUELOS

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!



MEET THE NEW RD – Gloria Rodriguez Bañuelos just completed her doctorate at Stanford University, School of Education.

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 unequal distribution of material and human resources in California schools. As a scientist, I came face to face with the stark difference between scientific inquiry in higher education and K-12 science education. The sum of the above experiences propelled me to probe California's K-12 educational system further.

In January of this year, I completed my doctorate at Stanford University, School of Education. In my dissertation, I investigated how scientists partnered with elementary school teachers and integrated science learning and language development for English learners. I found scientist-teacher partnerships first engaged young students in hands-on science experiences, and then used these same experiences as the basis for listening, speaking, reading and writing activities. A dual focus on science inquiry and English language development was an integral part of every lesson.

In California a quarter of all K-12 students are English learners which raises difficult, yet necessary questions about professional development that precisely addresses the educational needs of these students.

In the past, the K-12 Alliance has led the way in developing research-based, relevant and meaningful professional development programs. In the future, I look forward to expanding this expertise to pave the road for teachers of English learners. Through our collective experience we can help teachers help English learners not only discover the wonder of science, but more importantly, discover their inner scientist.

After all, at some point we all need someone to not only believe that we can be scientists and leaders, but to give us the **opportunity** to reach our full potential. Thank you K-12 Alliance for taking a risk, and allowing me to be part of an organization committed to improving science education across our Golden State. ■



The Good Questions

BY DAVID HARRIS

Picture a press conference with hungry reporters. "That's a good question" the governor says into the microphone, pondering a sufficient answer. "Good question" means she'd better take a second to construct a better answer. She knows her response has to frame a bigger picture.

Good classroom questions have this affect. In the book *Good Questions for Math Teaching*, Peter Sullivan, Pat Lilburn and Toby Gordon suggest that good questions have three characteristics:

1. They require more than remembering from the student.
2. Students learn from developing an answer to the question and the teacher learns about the student.
3. There is more than one acceptable answer.

Achieving these goals requires teachers to think ahead. First, teachers should consider how students learn from their attempts. Students must be aware of what part of their thinking is on the "right track" and be aware of what part of their attempt failed. That requires a previous series of questions in which a student notes success and also describes the process.

Consider the following pair of questions for a fifth or sixth grade student.

Teacher: "Note that $1/3 + 1/3 = 2/3$ and that $2/5 + 1/5 = 3/5$. Consider other fractions you can add. How do you add them correctly?"

Expected student response: "Just add the numerator and keep the denominator."

Teacher: "Will this rule work for any two fractions you add?"

How does the second question meet the three characteristics of good questions? First of all, the question does not assume nor require the student remember the rule for adding with unlike denominators – the expected hurdle they will eventually reach.

Students who come up against this cognitive dissonance will have to consider how their original rule works only for common denominators and see they need to make a more complete rule. They discover the need for common denominators. The teacher will learn from discussions or written responses how much the student knows about adding such fractions as $1/3 + 1/4$.

Ideally, the student response is a generalization that requires specific examples for clarity. This is indeed a powerful moment. A student learns the usefulness of examples and counterexamples. This is not a back-and-forth with the teacher; this is the student's own negotiation of clarity.

Students will understand the learning process is not just finding the right answer to a teacher's questions – it is "batting about" a concept student-to-student or through individual reflection. Teachers may then provide missing pieces or methods for students who need clarity. Teachable moments are made.

For science, the process is similar. Student use of example and counterexample does not come up as a result of asking for it directly, but as a result of allowing for it.

Whether the subject is comparing animal cells to plant cells or slip versus thrust faults, students who are allowed to describe something on their own before observing something that may change or refine their definition, is truly answering questions and not merely remembering.

This method gives students opportunities to learn from what they had to refine and gives them practice at justifying their answers.

Multiple solutions — or correct ways to describe — mean a set of possible correct answers. Defining



Environmental Partners

BY CHRISTIANE A. MAERTENS

Since the inception of Disney's Environmentality Challenge (DEC) in 1994, the K-12 Alliance has been a valuable partner to the program that began in California and has since expanded to Florida, Hong Kong and the Cayman Islands.

DEC invites kids in grades 3, 4 and 5 to make a commitment to help the environment by taking the Environmentality Pledge. Fifth grade classes are invited to take their commitment to the next level by developing a class environmental project and entering it into the competition for most outstanding project. Prizes are awarded to many students, with the Grand Prize being a trip for the whole class to the Walt Disney theme park in their region.

The tremendous success of the program has spawned many requests from classrooms in other states. In response, Disney has expanded the program to a national level and given it a new name: "Disney Planet Challenge." The new name helps students see that their commitments and projects have a global impact in preserving nature.



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.

THE GOOD QUESTIONS... CONTINUED ON PAGE 4

Summer Institutes: Fun and Learning... Together at Last!

Ah, the lazy days of summer, where time is spent swinging on the hammock, lazing in the grass watching the clouds go by, sleeping in until noon, fishing in the river and spitting watermelon seeds at each other. So much time on our hands...NOT!

This summer, teachers up and down the state of California gave up a portion of their well-deserved vacations to engage in intensive science and math professional development. Here's a recap of the exciting opportunities offered to these dedicated teachers.

Lake Elsinore/Temecula: Up, up and away... soaring with science in the valley! This summer was bursting with learning opportunities for teachers of Lake Elsinore Unified, Temecula Valley Unified and Hillcrest Academy as they began their second year of their science grant. This year, more than 60 teachers learned about electricity and magnetism, adaptations, astronomy and energy in the Earth.

In addition to the fantastic content, teachers were challenged to push their students' thinking with the use of science notebooks and accountable talk. After an energizing week, the teachers were ready to practice what they learned this year in their TLCs!

Shasta: Held in August, the Shasta County Math Partnership welcomed 56 teachers (from third grade through Algebra I) to the 30-hour mathematic event which covered operations and conversion of decimals, decimals 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 mathematical 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 LAKE 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 specialist from a local nature reserve – 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



HARD AT WORK — Participants from Lake Elsinore School Institute discuss with gusto.



SUMMER INSTITUTE SMILES — Participants at this year's summer institutes—including Teresa Mitchell, staff developer Kings Canyon (from left); Brad Schleder, science coach Kings Canyon; Sue Bratcher, CSU Fresno; Josie Fierro, staff developer Sange; Heidi Betancourt, staff developer Sange; and Emily Rowell, staff developer Kings Canyon — strike a pose.

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: New beginnings are always exciting! Coachella kicked off the new CaMSP project Students Understanding Mathematics targeting grades 3 through algebra. While 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.

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! ■

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.