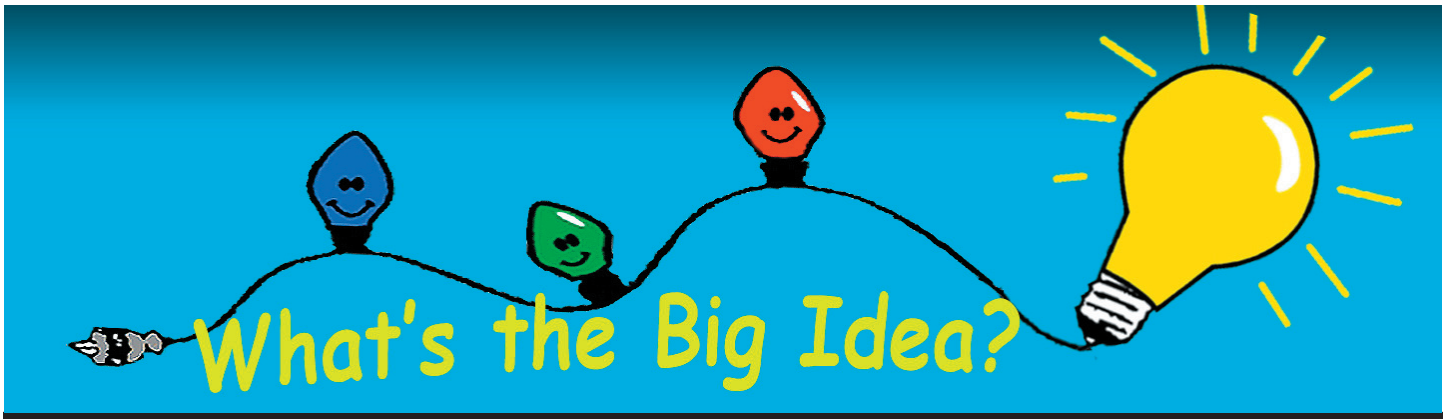

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Let's Give Them Something to Talk About (Part 3)

Editor's Note: This is third and final article in a series on how science instruction serves as the organizing context for students in English Language Development.

"I don't go to ELD anymore, now I get to go to science instead.'' This quote from a student in Montebello and reported by Susan Gomez-Zwiep (et al), in the Journal of Science Teacher Education (2011) 22:769–785) says it all!

Students from the four ITQ/CPEC schools in the Montebello Unified School District (MUSD) no longer participate in isolated English Language Development (ELD) instruction, but rather learn to use academic language in the highly contextualized world of science inquiry. They truly have something to talk about!

This article highlights three specific tools and/or protocols that helped Montebello teachers integrate ELD with their inquiry-based science instruction.

Throughout the K-12 Alliance's work with Bell Gardens Elementary and the ITQ/CPEC grant, teachers developed science lessons using Teaching Learning Collaborative's (TLC) 5E Learning Sequence (see Let's Give Them Something to Talk About! Parts 1 and 2, What's The Big Idea? 2012).

Teachers incorporate specific methods so students are encouraged to use verbal language while they are learning scientific concepts. Teachers then organize their teaching into three steps: predict student responses to prompts at varying language levels, align language functions with science thinking skills, and develop sentence frames that mirror the language that's expected to be used during science.

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Tool/Protocol #1: Finding the Right Words

Montebello teachers agreed that oral language development for English Learners, aka learning to effectively speak, paves the way for efficient reading and writing skills. Since most classrooms teachers do most of the talking (and most of the thinking), Montebello teachers wanted to hear their students talk about science, which ultimately will help them develop their verbal skills.

The following is an example of a lesson plan that focuses on oral language at three levels. In this plan, teachers predict the expected student responses for each prompt during a hands-on, inquiry-based lesson about stable position. Notice the lesson includes a science learning sequence concept, a language objective, and, at each phase of the lesson plan, a science concept with an accompanying language function.

TALK, CONTINUED ON PAGE X

DIRECTOR'S COLUMN

A Crack in the Door: Science Education Coming Through

By Kathy DiRanna

Long ago, in a galaxy far away, Sputnik went off in the 1950s and changed the face of American science education—as long as you were white, male and smart. That left most of us out in the cold. But that didn't matter, because in the 60's we were being relevant. In the 70s and 80s, Johnny couldn't read (because he had been basket weaving in the 60s) and science languished.

Oh sure, with a *Nation at Risk*, science was still around, but the 90s heralded the "Era of Wars." First came the English-Language Arts wars (whole language vs. phonemic awareness—the latter won out) followed by the math wars (drill and kill vs. problem solving—the former won out).

There were even science wars—inquiry vs. reading about science, but STAR wars (no, not that one) solved that problem. Standardized Testing and Reporting—better known as the STAR test—made sure that few cared about the outcome of the science wars because STAR focused schools on English Language Arts and Mathematics as the only subjects that mattered.

Enter 2010ish.....STEM (science, technology, engineering and mathematics) gains traction on the national, state and local level. A few brave schools break out of English/Math only and recognize the disservice done to children by keeping science from them.

Then in 2012, California forms a STEM Task Force to produce a blueprint for STEM education, and the Next Generation Science Standards (NGSS) become available for public review.

And just like that, a crack in the door appears.

Well, we intend to drive the bulldozer right through and once again establish science as a CORE curriculum!

The NGSS combine *Practices* (both scientific inquiry and engineering practices) with *Core Ideas in the Discipline* (that would be big ideas!) in life, Earth, physical and engineering and technology with *Cross Cutting Concepts* that tie the big ideas across disciplines. These standards are what students need to know to USE science content in real world applications.

The Common Core State Standards (CCSS) in English Language Arts also call for students to read and write in history, social science, science and other technical subjects. The CCSS, like NGSS, are application standards.

Amazingly, here are two new sets of standards—NGSS and CCSS—that focus on problem solving, decision making, real world application. Both standards de-emphasize bits and pieces of information in favor of building student conceptual frameworks.

California adopted the CCSS in 2010 and California students will take the national assessments in 2014-2015 when they are available. NGSS will be nationally adopted by December 2012. California will decide, between March and July 2013, whether to adopt the NGSS as is, modify them, or do something completely different. Our hope is one of the first two choices, with "crossed fingers" for the first choice.

As the K-12 Alliance celebrates 25 years of professional development, we also celebrate that finally the pendulum is swinging back to the 1950s—with a twist that science education is for ALL students.

The battles we have fought so hard to maintain a science presence in the classrooms have a chance to lay the groundwork for amazing STEM education and excited meaningful learning for students. All this activity makes me think of a line from *The Shawshank Redemption*: "Hope is a good thing...perhaps the best of things. And good things never die."

Here's to quality science for many years to come! ■

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Baby Steps to the Big Idea

By David Budai

My leadership journey with the K-12 Alliance began in the fall of 1997 when I was in my third year of teaching.

I love science and I knew I had found common minds with K-12 Alliance because all their people were speaking my language (except for the new host of acronyms: CSIN, SPAN, SS&C, 5Es, etc.). As soon as I cracked the K-12 Alliance language barrier, I was ready and eager to study my teaching, enrich my science content knowledge and engage my students.

Within the first few weeks of school, student excitement about learning science spread throughout the student body and soon teachers were at my door wanting to know what the commotion was all about. I was quickly elected grade-level lead due to my enthusiasm and "vision."

A few years later, I became a staff developer for the K-12 Alliance. Besides learning the ropes of group presenting and supporting adult thinking, I began to acquire the skills, techniques and art of Teaching Learning Collaborative (TLC) Lesson Study facilitation.

In 2003 our district was awarded a cohort 1 CaMSP and I entered the cadre world of the K-12 Alliance. TLC facilitating did not end when I entered the cadre world; on the contrary, I found the blending of staff developer/cadre enriching and insightful on how people learn. The staff developer/cadre experience assisted my transition from science to math when my district was awarded a cohort 6 CaMSP in math.

As project director in the final year of our cohort 6 CaMSP, I am truly grateful for the training and guidance from the K-12 Alliance. Learning has never stopped and the application of new skills and techniques continues to make each day fulfilling and rewarding.

I'm looking forward to our summer trainings with our two CPEC grants: SWIRL (Science Writing Impacts Real Learning) and SDL (Science Drives Literacy). I'm proud to say that our staff developers and cadre are second to none and that our students will continue to receive the best instruction in math and science. ■

"...the application of new skills and techniques continues to make each day fulfulling and rewarding."

David Budai

David Budai is a Project Director (CaMSP), Coachella Valley USD

Teacher Reflections: Go With the Changes!

By Melissa Smith

It's hard to believe that the school year is practically over! As this whirlwind year comes to a close, I finally have a chance to reflect about what I have learned these past months as a returning teacher.

After being out of the classroom for three years, I thought it would be easy to pick up where I had left off. Quite the contrary! Three years is a long time. Kids have changed, and more importantly, I have changed, especially my willingness to try new approaches in order to "get through" to my students. If one method doesn't work, I am very open to trying something else.

Through the process, here are lessons I have learned:

1. Go slow to go fast. Sometimes the end-of-the-year state testing causes us to move too quickly through content and we don't stop to see what the students are truly understanding. I was so discouraged when this year started because it took forever to teach a concept. I wanted the students to think for themselves, but they were simply waiting for me to provide the information so they could pass the test. Concepts and activities that would normally take one period to complete were taking 2-3 days! I knew the only way my students would really learn was if they were learning for themselves, but I was also watching the months tick by, and I still had three/fourths of my standards to cover. Then, something amazing happened. The new year arrived and my students were thinking for themselves, asking questions of each other before asking them of me, and working in groups PRODUCTIVELY! All of a sudden the processes, patterns and expectations I had spent so long setting into place were bearing fruit and we were moving swiftly through the content. I realized that sometimes it's better to keep your expectations high and take time in the beginning to help your students achieve them than to give up and either lower the expectations, or stop providing opportunities for students to discover the information for themselves.

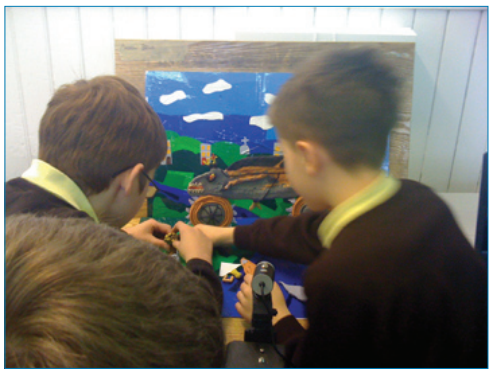
2. Don't make excuses. I've heard it, I've said it, and I've believed it. The students don't care, the parents don't care, and there is not much I can do if I don't have the support at home. Often times, the most frustrating and misbehaved students are the ones with little to no support at home. I have watched many teachers give up on these students and these "classes" because the effort to get a "horrible" class to learn and behave in a group environment is just too much. Believe me, I understand. I had a class like that this year. All the "behavior issue" students in this one class were milking every bit of my strength daily. But, our job is to teach ALL students and we need to stop making excuses or giving up. Sometimes the worst students end up being the most unique thinkers and will surprise you if given the chance...it just takes a little longer.

3. Don't rest on the same ol' routine, try something new. Our world is moving so quickly and we need to change with it. Before next year, decide on something that you want to try differently. Trying to change everything at once will make you crazy, but you may discover that one little change will be just what your students' need. Teaching gives us the opportunity to reinvent ourselves each and every year.

4. Make sure the work your students are doing documents their thinking, not yours. Even with all of the effort I made to give my students the best learning opportunity possible this year, their science notebooks were not reflecting their learning. I made changes in the moment, but I also have devised new plans for next year. For example, during my entire 15 years of teaching, I always instructed students to answer a journal question at the beginning of class. The questions did all the things they were supposed to

REFLECTIONS, CONTINUED ON PAGE 11

Off the Page and Into the Frame



Film festivals, animation and....science education?

Yes, there are connections!

With high student engagement, these creative outlets are great opportunities to show student thinking in novel and intriguing ways. These activities are also the base for an exciting new workshop that will be offered this summer for educators who want to help their student's go deeper with their thinking.

Working on a California Post Secondary Education Commission Improving Teacher Quality Grant called *Science Drives Literacy* in Coachella Valley Schools, Regional Director Karen Cerwin recently attended an animation festival through a connection with anatomy and biology CSUSB professor. Dr. Stuart Sumida. The duo visited Animex International Festival of Animation and Computer Games at Teesside University in Middleborough, England, and witnessed first-hand how elementary students are able to produce a film in one day.

PI on the *Science Drives Literacy* grant, Sumida also serves as technical advisor to several film companies, providing advice to animators on the biology of movement. Films with his touch include: *How to Train Your Dragon* and *The Lion King.*

Because of his role with studios, Sumida made connections with the Animex – including festival originator Chris Williams – and has regularly attended the festival since 2005.

Mixing art and biology "has been a natural event for me," says Sumida. "It lets me do academic work, but also showcase the relationships I have with numerous animation and special effects companies."

The four-day festival, held the second week of February, despite the coldness, exudes an air of excitement with interesting speakers, presentations, awards and networking opportunities for university students and professional animators.

"The festival prides itself on being inclusive and a place where people meet to be educated, inspired and entertained," says Sumida who often presents at the festival.

It's not just older students that get something out of the festival—local elementary students (grades 4-6) also participate in full-day sessions.

What exactly are these young students learning? How are animators preparing them for a film presentation in just one day? What is the science connection?

To begin, students first hear about the story they are going to tell. They also learn that good animation or any other film is always about a story well told.

Students on all levels begin with a "cartoon-like" storyboard with images of the story they want to tell. Once the story is complete, students design the set (in a paper box) and characters (clay or pipe cleaners) and they are ready to film using an age-appropriate software program that was designed by Animex directors.

After many computer pictures are generated, the action is reviewed and edited. Finally, music and finishing touches such as credits make the final cut. The result is amazing stop-motion animated films that range from a few seconds to a few minutes. Imagine dinosaurs roaming around on the streets of Southern California or insects marching together over the hill. Or tarantulas crawling around California missions.

The science education connections are many. Students must have an understanding in science when they prepare storyboards that involve creatures from the natural world; they must also take into account technical advice from Sumida on how specifically animals move.

In the end, the students have a completed piece of artwork that resonates with biological themes – they have been engaged and excited to learn and create.

Now, from England to California!

Sponsored by the K-12 Alliance, *Science Drives Literacy* will offer a two-day training session for teachers so educators can use principles Cerwin and Sumida observed at the film festival.

The workshop will show how to help students develop a storyline, which will reveal what they know about a concept. They will also learn how to design sets and characters (correctly animated according to their biology) and finally film their story.

Animation and filmmaking could become a student pathway to science AND animation work. It is an exciting leap for students to show what they know! The *Science Drives Literacy* teachers are looking forward to learning and implementing this new strategy. Stay tuned and watch for more details on dates and details! ■

The Standards Are Coming!

The Next Generation Science Standards, based on "A Science Framework for K-12 Science Education" developed by the National Research Council, have been released for public review.

Representatives from 26 states, California being one of them, have been reviewing the documents prior to their release to the public. The states began the review in 2011 and will continue to provide input until the standards are adopted in December 2012.

The standards provide the basis science education that focuses on a body of knowledge, its application to real life, and a way of knowing. The standards will guide the design of instructional materials and assessment and provide a guideline for teachers to teach.

Standards are based on the combination of three important ideas:

- practices,
- core ideas in the disciplines, and
- cross-cutting concepts.

Practices include both scientific inquiry and engineering practices. Practices describe behaviors that scientists engage in as they investigate, build models and compose theories about the natural world; this also describes the key set of engineering practices that engineers use as they design and build models and systems.

Science and engineering are indeed similar, but they are different. Scientific inquiry involves the formulation of a question that can be answered through investigation, while engineering design involves the formulation of a problem that can be solved through design.

The standards explain eight important practices:

1. Asking questions and defining problems
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics, information and computer technology
6. Developing explanations and designing solutions
7. Engaging in argument
8. Obtaining, evaluating and communicating information

The core ideas in the disciplines include "Big Ideas" that spiral through K-university understanding. NGSS addresses these ideas in life, Earth and physical science. Engineering and technology are added as a fourth discipline.

Cross-cutting concepts provide a basis for integrating the discipline and helping students understand that science and engineering are often very connected. For example, energy as photosynthesis is related to energy as lighting a bulb with a battery and both are related to energy that causes earthquakes.

NGSS recognizes these cross-cutting concepts:

1. Patterns
2. Cause and effect: mechanism and explanation
3. Scale, proportion and quantity
4. Systems and system models
5. Energy and matter: flows, cycles and conservation
6. Structure and function
7. Stability and change

The following example shows how these three important ideas might be combined in activity.

CONTINUED ON THE NEXT PAGE

Teacher: *Take independent observations of the two liquids you have in front of you. Use all your senses, except taste, and record your observations in your notebook.*

Student: *(Observation notes from the two liquids below)*

Both liquids are clear.
#1 has no smell; stays on finger when touched; doesn't cling to side of cup
#2 has a smell; cools finger and seems to evaporate; clings to side of cup

Teacher: *Place an ice cube into each cup. Observe and record your observations in your notebook.*

Student (observation notes from cup #1 below)

The ice cube floats in the liquid. Part of it is submerged, but part of it is exposed above the water level. The liquid remains clear. A few bubbles appear around the ice cube.

(Observation notes from Cup #2 below)

The ice cube sinks in the liquid. The liquid remains clear, but there appears to be a slight layering of the ice water as it melts.

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STANDARDS, CONTINUED FROM PAGE 7

(Teacher then has students share their observations with their partners.)

Teacher: *Let's see if you can determine how to draw what you think is happening in each cup. With your partner draw a model on the whiteboard that indicates how closely packed the molecules would be in the ice and liquid #1; and in the ice and liquid #2.*

Explain in writing how you know which materials (ice and liquids) have the same density, greater or less density.

(Students then draw and write their explanations.)

This activity addresses NGSS practices #4 (analyze and interpret data) about a Big Idea (matter has properties—density) and incorporates cross-cutting concept #2 cause and effect: mechanism and explanation.

Keep in mind this ONE activity won't result in students understanding these ideas right away, but this investigation is only an example showing how teachers can help students build understanding with similar types of learning experiences.

Another "bonus" for this type of activity is that it ALSO addresses the Common Core State Standards in English Language Arts.

For example, in Oral Language/Speaking and Listening, if the teacher asked the students to present their drawing and explanation, that would align with this fifth grade CA CCSS-ELA standard:

Present claims and findings (e.g., argument, narrative, response to literature presentations), emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

If the teacher has the students write their explanation, using appropriate academic language, she would align the learning to this fifth grade CA CCSS-ELA standards for writing:

Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

a. *Introduce a topic clearly, provide a general observation and focus, and group related information logically; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.*
b. *Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.*
c. *Link ideas within and across categories of information using words, phrases, and clauses (e.g., in contrast, especially).*
d. *Use precise language and domain-specific vocabulary to inform about or explain the topic.*
e. *Provide a concluding statement or section related to the information or explanation presented.*

If you missed this review this year, there will be another in the early fall.
If you are interested in participating, keep checking with NGSS at visit www.nextgenscience.org for the dates.

The NGSS should be adopted nationally by December 2012, and California will decide by July 2013 if they also will adopt the standards in their current form.

For more information about the NGSS, visit www.nextgenscience.org.

TALK, CONTINUED FROM PAGE 1

Sample 5E Lesson Plan with an ELD Option

Learning Sequence Concept: A stable position is achieved when all forces acting on the object are balanced, i.e., the center of mass of the object is below the pivot point. (Note: Students already know that a force is a push or pull.)

Language Objective: Orally describe cause and effect for a stable position to occur. Write a claim about stable position supported by evidence.

Teacher Does (Prompts)	Student Does (Expected Student Responses)			Science Concept and Language Function
	Beginning to Early Intermediate	Intermediate	Early Advanced to Advanced	
Engage 1. What is a stable position? Why is the object stable?	Oral rehearsal: Student uses phrases such as: not falling, not moving, strong.	Oral rehearsal: I put _____. The ____ did not_____.	Oral rehearsal: A stable position is when_____ and _____ .	For an object to be in a stable position the center of mass of the object is below the pivot point.
2. Describe your reason to your partner.				
3. Write or draw your responses on the top of your chart paper.	Written response: Student draws a picture with labels.	Written response: I put _____. The ____ did not_____.	Written response: A stable position is when_____ and _____ happen.	Oral and written description of observation. Preliminary description of cause and effect.
Explore 4. Predict whether each shape and clothespin is in a stable position.	Oral rehearsal: Student uses phrases such as: yes, no	Oral rehearsal: This one is stable.	Oral rehearsal: I think the _____ is stable. If we put the _____ here, it will be stable.	For an object to be in a stable position the center of mass of the object is below the pivot point.
5. Record your predictions as yes or no.	Written response: Yes (Y) or no (N) as prediction.	Written response: Yes or no prediction	Written response: Yes or no prediction	Oral and written predictions.
Explain 6. Revise your explanation of stable position.	Oral rehearsal: Student uses phrases such as: not falling, not moving, stable.	Oral rehearsal: I put _____. The ____ did not_____. It is ____ (stable). Before it was____. Now it is ____.	Oral rehearsal: I used to think a stable position was when_____ and _____ . I now think a stable position is _____ ____.	For an object to be in a stable position the center of mass of the object is below the pivot point.
	Written response: Student revises drawing and now uses the word stable as a label.	Written response: I put _____. The ____ did not_____. It is ____ (stable). Before it was____. Now it is ____.	Written response: A stable position is when_____ and _____ .	Oral and written description of cause and effect.
Extend 7. Use your understanding of stable position to put the pencil in a stable position.	Oral rehearsal: I put _____. The ____ did not_____.	Oral rehearsal: If we put the ____ __ here, it will be stable.	Oral rehearsal: If we place the ___ ___ here, then the pencil will be stable.	For an object to be in a stable position the center of mass of the object is below the pivot point. Oral description of cause and effect.
Evaluate 8. Write your claim about stable position. Give evidence to support your claim.	Written response: The ____ is stable. I know because___ __.	Written response: I claim that_____. My evidence is _____.	Written response: I claim _____ because my evidence is _____.	For an object to be in a stable position the center of mass of the object is below the pivot point. Written description of cause and effect.

TALK, CONTINUED ON PAGE 10

TALK, CONTINUED FROM PAGE 9

Tool/Protocol #2: Searching Through the Standards

In order to design similar integrated lessons, teachers also needed to be strategic about the science thinking processes and language functions students would use to build meaning about science.

During planning sessions, teachers often referred to their science standards and ELD standards for help. The following chart is a simplified version of that standards' "search."

Examples of Language Functions And Science Practices
Adapted from: *FOSS Science-Centered Language Development (*2011)

Language Functions	Science Practices
Ask questions	Asking questions
Observe Record Plan Measure Organize	Collecting, analyzing and recording data
Construct Communicate	Constructing explanations and critiquing arguments
Explain Describe Compare	Modeling explanations
Predict Discuss Evaluate Justify	Making predictions Devising a testable hypothesis
Identify Distinguish Clarify	Communicating and interpreting data
Apply Solve	Applying and using scientific knowledge

Tool/Protocol #3: Speaking Their Mind

In order to put science/ELD lessons into practice, Montebello teachers also needed to help students use oral language "in the moment." During planning sessions, teachers created specific sentence frames or language forms for each lesson and language development level.

The following are examples of sentence frames distributed to each pair of students at an appropriate time during the lesson. Notice the varying color of the sentence frames. Students were encouraged to "try the red one" as their confidence with language increased.

Students who were not yet proficient in science now had the means to process and communicate their understanding in science!

I see (hear, smell, fell, taste) _____

I observed _____

When I observed the _____ **, I noticed** _____

I claim that _____

My evidence is _____

I claim that _____ **, because** _____
I agree/disagree with your claim of _____ **, because** _____

All in all, this year' three lead articles have provided many possibilities for educators to help students grasp and master meaning and language through the wonders of science. The K-12 Alliance continues to seek funding to continue helping teachers to bridge together science and language. Let's really give our students something to talk about! ■

The K-12 Alliance
25th Anniversary Celebration!

Friday, June 22, 2012
5:30 p.m.

Atrium Hotel
18700 MacArthur Blvd
Irvine, CA 92612

Please join us for an evening of laughter, memories and dancing!

We have reserved a block of rooms at the hotel for the rate of $92.40 single/double. Please make and pay for your room directly with the hotel (tell them you're with the K-12 Alliance to get the special rate).

BBQ dinner and drinks are $75 per person. Please make check payable to WestEd.

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Questions? Call Doris at (714) 438-3802

Hope to see you there!

REFLECTIONS, CONTINUED FROM PAGE 4

do: process information, reflect on what they had learned, think about a new idea that had never occurred to them, etc. Unfortunately, these questions were separate from my students' other work! Next year I plan to have a task for my students to complete each class day. Instead of asking a question about the lesson from the previous day, I want them go back into their notebook and DO something with that learning. Maybe they will write a question, answer a question, or contemplate a pre-think before starting something new. I'm very excited to try this new method!

I hope these suggestions provide a springboard to your own new ideas and future learning. For me, this school year presented one of the most challenging in my career; however, the experience also provided me with a new enthusiasm for the art of teaching. I plan to add to next year's arsenal and I know that the desire to change will make me a better person and teacher...which will give my students a better chance of success. ■

Melissa Smith is an eighth grade science teacher at Canyon Lake Middle School in Lake Elsinore USD. She returned to the classroom after three years as the project director of LEUSD's MSP grant.