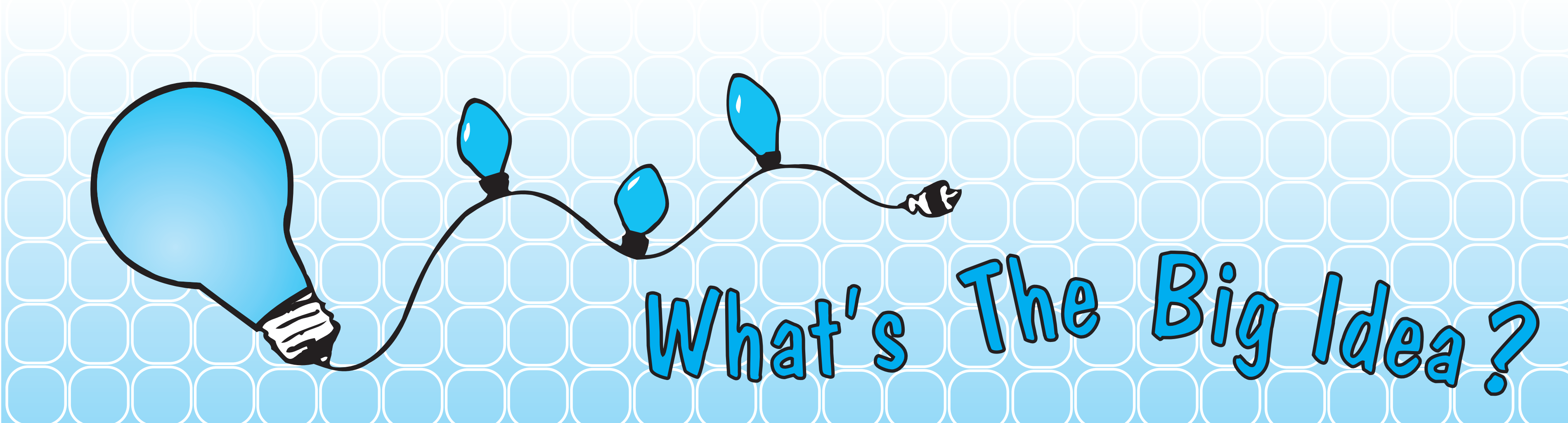

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Take AIM When Choosing Materials

Editor's note: Continuing to celebrate 20 years of professional development success, the lead stories for this and the March issues address the importance of advocacy for quality science education.

This year, every district in the state has the opportunity to decide what it stands for and what it supports in science education by their selection of instruction materials for grades K-8. The state recently adopted 11 publishers for these grades, giving districts a wide variety of content material, instructional design and relevance from which to choose.

Whatever process your district uses to select, we encourage you to be thoughtful and make your decisions based on evidence. And remember: your choice will be with you for 7 more years! Make it count!

When you consider the role of instructional materials in the teaching/learning process, what comes to mind? Are you interested in materials that are student-centered? That have concepts coherent to develop student understanding? Use a variety of assessments to measure student achievement? Provide resources to assist the teacher in teaching the content?

Well, as we know, all instructional materials are not created equally!

Some curriculum developers design instructional materials as a framework wherein learning experiences are organized and sequenced to maximize student outcomes. These outcomes include understanding science as a way of knowing and as a body of knowledge.

Other developers represent science primarily as a body of facts to be learned by the students, often including hands-on activities to simply verify concepts previously described in the text. Unfortunately, this approach to curriculum development has often resulted in instructional materials that are not supportive of how people learn (Bransford, et al., 1999) or reform-based teaching practice (Kesidou & Roseman, 2002; Hubisz, 2001).

So how can you best select instructional materials that will meet both teachers' and students' needs?

In a nutshell: skip the status quo!

Instead of going through a process that is often opinion-based (rather than evidence-based), cursory (i.e. the "thumb-nail" test) and isolated from professional development and classroom practice, use the Analyzing Instructional Materials (AIM) Process.

What is the AIM Process?

AIM is an evidence-based process for analyzing and selecting instructional materials that was designed as a professional development experience to support curriculum implementation.

Developed by the K-12 Alliance (WestEd) and adapted by BSCS, the AIM process uses collaborative inquiry focused on asking questions, gathering information and making decisions based on evidence.

The AIM process is comprised of three major phases: pre-screen, paper screen and pilot (see Fig. 1) which can serve as the centerpiece of a professional development program as well as being a "spring board" for sustained curriculum reform.

More specifically, the three AIM phases includes:

- The **pre-screen phase** is a process to narrow the choices of instructional materials for a complete review using the AIM process. In the pre-screen phase, reviewers look at student assessments and investigate how students come to know that which they would produce on assessments. Materials that align with a district's criteria for quality learning experiences remain as contenders; those materials that are misaligned are dropped from consideration.
- During the **paper screen phase**, instructional materials are analyzed by the selection team and data is gathered to determine how well the instructional materials meet each of the district's selected criteria/rubrics. The scores from each criterion are then weighted and summarized. This results in identifying instructional materials to be piloted.
- The **pilot phase** is a systematic approach for determining if the materials "work with students" and with teachers. Data is gathered from student work and from teacher reflections. This data is analyzed and finally integrated with the evidence (scores) from the paper screen. A final score -- based on the paper screen and the pilot -- is achieved. The instructional materials are then rank-ordered from these scores and a final selection is made.

IN THIS ISSUE...

The AIM process addresses the limitations of typical selection processes by helping schools and districts understand the characteristics that distinguish high quality student-centered instructional materials from more traditional materials.

In addition to examining the science content in instructional materials, the AIM Process asks

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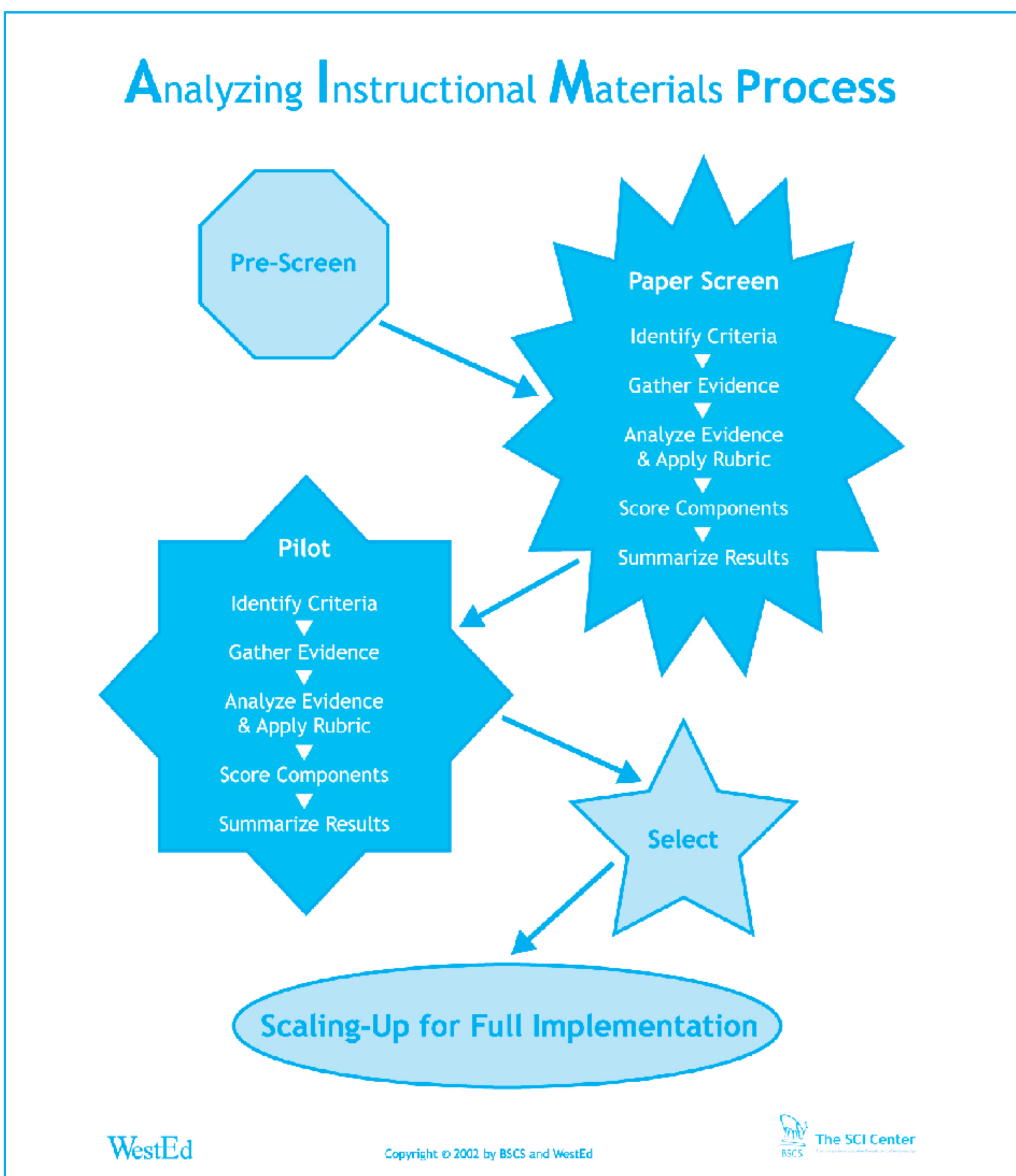


Fig. 1

DIRECTOR'S COLUMN

Things I Didn't Know When I Decided to Teach

BY KATHY DIRANNA

My life for the past two months has been driving the 60, the 10 and the 405; getting up at 0'dark hundred to meet the Teaching Learning Collaborative (TLC) team at 7 a.m. so that we could do the final preparations; driving home at 0'way past sundown after completing a full day of teaching and learning for students and teachers alike.

And these two months build on 10 years of doing TLCs with a variety of teachers — those new to the profession and those who claim they've seen it all. Each time I do a TLC, I continue to be amazed at the power of meaningful lesson design, and of our struggles to be ready for all the nuances 36 students can present in a 57 minute lesson!

And so I continue to think about things I didn't know when I decided to teach. Things like:

I didn't know that years of school and a college degree would be of little consolation when facing a room full of students on the first day of school. I thought I was ready...

I didn't know that teaching children was about their learning, not my knowledge...

I didn't know that five minutes can seem like five hours when there is idle time and an eight hour school day is far too short for a well-planned day of teaching...

I didn't know there would be students I would worry about late into the night who, one day, would simply not show up. And that I would never see them again...

I didn't know the joy I would experience when the light finally clicked for a student or the thrill I would know when teaching and learning were synergistically intertwined...

And I didn't know that one day, I would no longer call teaching my job, but my privilege.

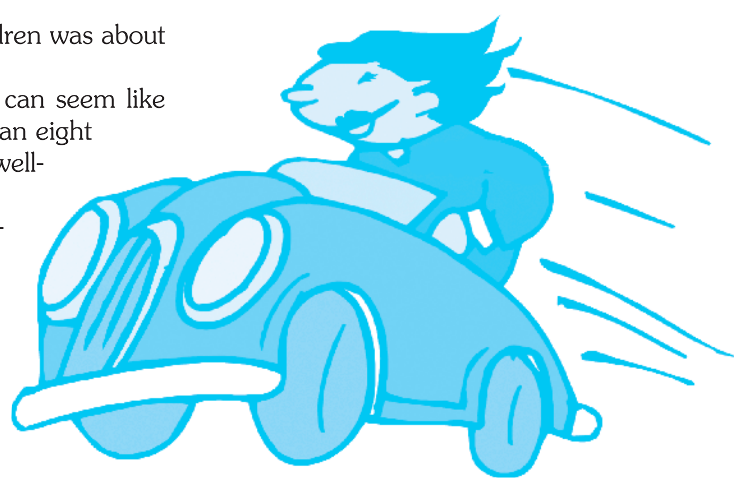
I have been lucky that that day is everyday. I am humbled by those of you who came to learn from the K-12 Alliance. You exceeded beyond our own imagination.

I am floored by those who came unsure of leadership, yet lead by example. I stand in awe of new teachers and veterans who, through collaborative inquiry, continue to improve their practice.

To all of you who have contributed your time, energy and hearts to improving science education, I say thank you on behalf of the students' lives you've touched.

And finally I say OK...I'm happy to be on the road again!

■



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TAKE AIM... CONTINUED FROM PAGE 1

WORK STUDENTS DO RUBRIC	(5)	(3)	(1)
QUALITY LEARNING EXPERIENCES Characteristics of Quality Learning Experiences include: · learning goals are clearly defined within an inquiry-based learning cycle/sequence · activities are engaging, relevant and developmentally appropriate for students · students are in control of their own learning by monitoring their progress in achieving learning goals · student collaboration is an integral part of the learning experience · students use a variety of resources (e.g., equipment, media, technology) in and out of the classroom to explore ideas and solve problems.	The materials engage students in activities that have many characteristics of quality learning experiences.	The materials engage students in activities that have some characteristics of quality learning experiences.	The materials engage students in activities that have few characteristics of quality learning experiences.
ABILITIES NECESSARY TO DO SCIENTIFIC INQUIRY Students doing scientific inquiry involves · asking and identifying questions and concepts to guide scientific investigations, · designing and conducting scientific investigations, · using appropriate technology and mathematics to enhance investigations, · formulating and revising explanations and models, · analyzing alternative explanations and models, · accurately and effectively communicating results and responding appropriately to critical comments, · generating additional testable questions.	Investigations provide experiences that focus on most of the fundamental abilities of scientific inquiry.	Investigations provide experiences that focus on some of the fundamental abilities of scientific inquiry.	Opportunities to develop the abilities necessary to do scientific inquiry are limited or absent.
UNDERSTANDINGS ABOUT SCIENTIFIC INQUIRY The work scientists do includes · inquiring about how physical, living, or designed systems function; · conducting investigations for a variety of reasons; · utilizing a variety of tools, technology, and methods to enhance their investigations; · utilizing mathematical tools and models to improve all aspects of investigations; · proposing explanations based on evidence, logic, and historical and current scientific knowledge; · communicating and collaborating with other scientists in ways that are clear, accurate, logical, and open to questioning. The work scientists do connects to student learning by students · planning and conducting investigations; · utilizing equipment, tools, mathematics, and technology in investigations; · proposing logical explanations based on evidence and scientific principles; · communicating with others and practicing legitimate skepticism.	The materials provide students with many opportunities to understand the work scientists do and make connections to student learning.	The materials provide students with some opportunities to understand the work scientists do and make connections to student learning.	The materials provide students with few opportunities to understand the work scientists do and make connections to student learning.
ACCESSIBILITY When addressing the diversity of learners, consider the following: · varied learning abilities / disabilities · special needs (e.g., auditory, visual, physical, speech, emotional) · English language proficiency · cultural differences · different learning styles · gender	The work students do is consistently accessible to diverse learners, providing opportunities for all students to achieve.	The work students do is often accessible to diverse learners, providing some opportunities for all students to achieve.	The work students do is rarely accessible to diverse learners, providing limited opportunities for all students to achieve.

Fig. 2

teachers to think about the role these materials have in promoting student learning and supporting teaching strategies.

In light of these characteristics, the process helps schools and districts reflect and come to agreement on what they value and want to see in instructional materials (i.e., establishing school or district-specific selection criteria).

The criteria are then developed into rubrics that are used for scoring. For example, a school that is interested in instructional materials that provide rich student learning experiences might design a rubric for student work as illustrated in Fig. 2 (see above).

How is the AIM Process different from other methods for evaluating instructional materials?

Unlike some tools for evaluating instructional materials, AIM is not a checklist. It is a dynamic process that

TAKE AIM... CONTINUED ON PAGE 4

What's The Big Idea?

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LEADERSHIP

Is the Coach Supposed to Learn More than the Student?

BY MICHAEL COUGHLIN

It's cliché to suggest that, as a leader working with teachers, "I've learned more from you than you'll ever know." However, after a year and a half as a Science Coach for fourth and fifth grade teachers, that truth becomes more apparent every day.

Lodi is participating in a California Math and Science Partnership; our project involves coaches working with teachers on a one-on-one basis, and facilitating a collaborative lesson study with teacher teams.

Part of the overall mission includes fostering an adult learning environment focusing on content and pedagogy, enabling teachers to increase effectiveness in classroom practices. If I had to compare who has learned more — the student, the teacher, or the coach — I would say that, as a coach, I'm at the top of the list.

With years of science background, I expected to "brush up" on certain science content areas in preparation for my new leadership role. It should not have come as a surprise, but teaching adults requires a higher level of skills and understanding than teaching students.

It was a huge undertaking as I reviewed standards and key concepts, aligned them with activities, and packaged them into effective lessons.

While some of my full time job focuses on this, I've had to accept that participating teachers have a vast array of expectations, experience and background, which I have to take into consideration when working with them. And, assisting teachers — in and out of their classrooms — certainly takes precedence over paperwork!

Much of the one-on-one sessions involve helping teachers gain comfort with science concepts and connecting them to the standards. The biggest stumbling block: our engrained connection to textbooks and lack of time to stray from what's already provided.

The one-on-one time with teachers offers valuable conversation around the teaching of science. This can be sometimes awkward, but more often it's energizing when teachers make connections necessary to improve student learning. I've also found that when teachers collaborate together to design effective lessons, their confidence is greatly increased.

TLCs (Teaching Learning Collaborative) provide opportunities for teams of 3-4 teachers to engage in a lesson study where they plan, teach, debrief and review student work.

I originally thought teachers would be worried about being exposed to yet another grand scheme of lesson design, but I see teachers deeply value the collaborative process of discussing content, choosing appropriate questions and applying pedagogical strategies to deepen student understanding.

The answers are not in me, the coach — they are in them, the teachers. Individually the answers may be buried under anxiety and doubt, but small group dynamics shed light on our questions, and produce ah-ha moments that would probably never have been realized.

Truths Discovered

A big secret is that they're ah-has for me too! (Don't tell anyone!)

Here are just two nuggets I've learned:

- *Sometimes we teach things that don't focus on or even support the standard.*

  For example: In a conceptual flow constructed during the planning of a lesson, a team identified certain concepts thought to be important for *student understanding. After teaching the lesson,*

IS THE COACH…CONTINUED ON PAGE 4

TEACHING & LEARNING

Cadre: Through the Eyes of One Professor

BY DR. DAVID POLCYN

The mind, once expanded to the dimensions of larger ideas, never returns to its original size.
— Oliver Wendell Holmes

The invitation came through a phone call from a K-12 Alliance regional director: Would I like to teach in a cadre of teachers for the upcoming summer institute for elementary teachers? Working in a summer institute was familiar to me but what was a cadre?

The caller gave an overview of cadre that meant working in a team of two of three teachers representing university, elementary or middle school, and high school. Cadres would meet in April and begin planning a collaborative summer session.

That phone call set in motion the beginning of a cadre that eventually became an authentic community of learners that involved elementary teacher David Bundai, a former high school teacher and informal science educator Lorrae Fuentas, and myself, a university professor.

The sum of working in a group (cadre) is truly greater than the parts. The pooling of expertise resulted in a heightened understanding of pedagogy and content on all levels.

Beginning with the April cadre training, we had many things to discuss: content, conceptual flow of concepts to build understanding, pedagogy needed for teachers and their students, question levels to use for building connections, and evidence of thinking and student learning within the lesson.

As a lone faculty member, I was used to presenting summer content presentations pretty much the same way I did in my college classes: through lectures. I was taken aback when teachers asked how an activity could be integrated into the classroom, I had no suggestions.

The truth dawned on me: I had no training at all in "education!" Thus, participants had to make their own connections and transfer the experiences for their own classrooms.

Within our cadre, David contributed experiences for adapting activities appropriate for younger students as well as pedagogical ideas such as reading and writing in science, working in small groups to process information, and finding sources for materials.

Lorrae provided articulation between the elementary experiences and high school experiences.

We ultimately became a real team with each of us learning from and building on the expertise of each other.

As a result of this eye-opening experience, my college classes saw the shift in my thinking. Ideas about conceptual flow of concepts became more explicit for my students. College professors have a strong sense of how concepts are linked yet often times, may be unaware that students do not see these connections.

One way I discovered the "invisible thinking" of my students was to add literacy tools to some labs by asking students to interpret content in a creative poem. First attempts were cursory but later poem details showed that students were engaged in the novelty of the experience as well as their lab work.

Grades in my classes are still based on the typical mid-term and final. It is primarily up to the student to ask for help when they do not understand. On the other hand, I am including some embedded assessments and group work to see student thinking in labs. I am aware of the role of connections between and among ideas in conceptual flows to enhance learning.

Pedagogy ideas for processing information through group interactions are gradually appearing in my classes but with class sizes approaching 250, opportunities are limited!

CADRE…CONTINUED ON PAGE 4

COLLABORATION

Content Saturday, Garvey-Style

BY GRETA SMITH

"Wow, it's been a while since I have been in a college classroom," was many of the comments heard bright and early on a Saturday morning in September when 15 teachers entered a science education classroom at California State University in Long Beach.

Their goal: increase their content knowledge in math and science.

Put together by CSULB assistant professor Dr. Susan Gomez-Zwiep, the ambitious content weekend would address the content needs of both math and science teachers at a variety of grade levels.

Along with David Harris of Vista School District, Dr. Gomez-Zwiep designed a day that looked at density and buoyancy with an emphasis on proportions — the mathematical reasoning why density occurs.

The goal behind the day's lessons was to have participants not merely describe that higher density objects sink, but have them describe different levels of buoyancy and to have a complete explanation of the proportion that describes distinctions.

Ultimately, density and buoyancy all depend on ratios and how they relate to each other, also known as proportion.

Here's how it was done:

The first participants completed an activity in which volume was constant and density was manipulated by changing the mass of an object. This was done by getting a film canister to float at different places in a graduated cylinder of water and then adding pennies/washers until the canister sank.

MATH ON THE BEACH -- Participants Daniel Felix (from left), Blanca Quiroz, Scott Castroll and Pat Molin at a recent content session do more than play in the sand. Following directions, the team used mathematics to design a coordinate plane and a large sand fish.

At the next step, participants removed the pennies/washers until the canister was made to float just below the surface. Expanding on the activity participants had just done, volume became the constant and the mass within the container was held constant.

For both activities, participants collected data on how the objects behaved in water.

A brief discussion followed on how density effected floating. "Where is the point when floaters became sinkers and sinkers became floaters?" asked David. Participants looked stumped at this point; they were directed to use the data that was gathered in the previous activities and create a mathematical explanation for the posed question.

The follow-up activity had participants find the mass and volume of several different materials including water, butter, brownies, and Styrofoam. Data points for mass and volume and were graphed and the line that connected data points for each material type had a slope that became their density.

With different density lines, this graph became a visual representation of which materials were floaters or sinkers in water.

CONTENT SATURDAY…CONTINUED ON PAGE 4

That's Amazing!

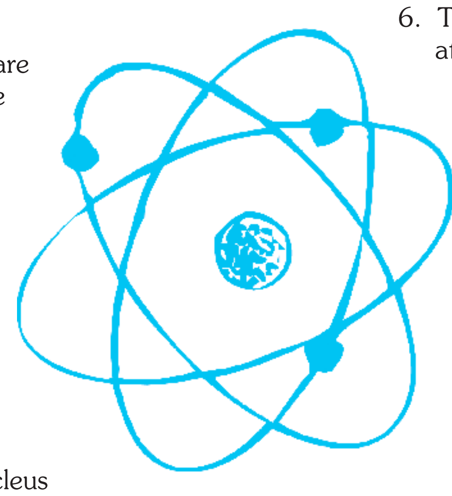
BY JAY BELL

Want to get kids engaged in a new unit of study? Here's a little tidbit you can try with your next class:

- Collect interesting statements or facts related to a topic or unit.
- Write each sentence (or fact) on a sentence strip or type up and cut into strips. Number each statement.
- Cut statements in half. Distribute a half to each student. Tell students to find their other half.
- In numerical order, ask each pair to read their statement out loud to the class and after each one, the class says, "That's amazing!"

Here's an example of some statements for a unit on atoms and molecules. Imagine the shouts of astonishment from your own students!

1. The atoms in your body are the same atoms that were in Einstein's body.
2. There are more atoms in your hand than all the grains of sand in the all the beaches in the world.
3. There are 90 billion billion atoms in a single drop of water.
4. Atoms, which form all "solid" matter, are almost entirely empty space.
5. Atoms are made of a nucleus containing protons and neutrons, with electrons around it, but far away.



6. The nucleus contains 99.9 percent of an atom's mass.
7. If an atom's nucleus was a basketball, electrons would be like bumblebees flying several miles away. Everything in between is emptiness.
8. An oxygen molecule in the air is moving at 1,000 miles per hour.

Jay Bell is a Science Resource Teacher in the Lodi Unified School District.

TAKE AIM... CONTINUED FROM PAGE 2

enables teams to construct their own collective understanding of instructional materials. It is not something that can be conducted in isolation, but requires the collaboration of teachers and administrators.

The AIM Process is not a means to an end, but rather, the beginning of professional development focused on curriculum implementation. The basic AIM steps include:

- Determining selected criterion that addresses context and critical issues specific to the district's needs.
- Gathering evidence to support or refute selection of the instructional materials through a thorough examination.
- Analyzing evidence and applying rubrics based on the selection criteria.
- Scoring components based on analysis of evidence and application of rubrics.
- Summarizing results and reaching a consensus.

Basic Steps in AIM

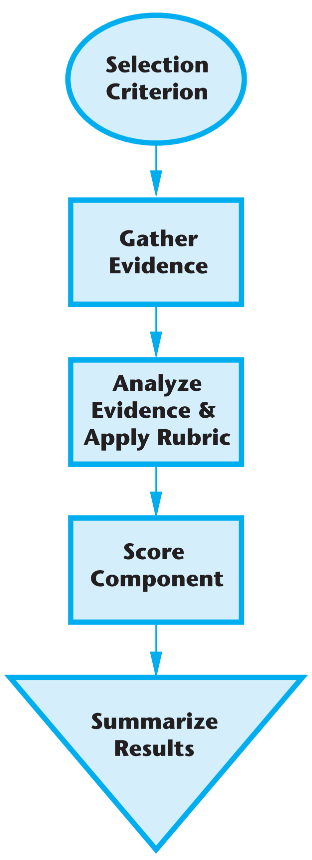


Fig. 3

One of the most important characteristics that distinguishes the AIM process from other curriculum selection/evaluation processes (see AAAS, 2001; NRC, 1999), is its usefulness as a professional development strategy.

While other processes tend to focus on using a series of standards or benchmark-alignment checklists that may be done by separate committees or individuals working in isolation, the AIM process is unique because it engages all teachers – who will be the ones ultimately using the instructional materials in their classrooms.

In addition, educators learn how to think critically about instructional materials and address implementation issues (e.g., time, resources, professional development) when they use the AIM Process.

Thompson and Zuelli (1999) point out that "a high level of cognitive dissonance to disturb the fundamental equilibrium between teachers existing beliefs and practice" is necessary for transformative learning to occur. The AIM process is such a tool – it causes cognitive dissonance.

Teachers, who have experienced the AIM process, have commented that they will never look at learning, teaching or the role of instructional materials in the same way again.

How can the AIM Process meet your needs?

AIM is an effective process that helps educators and other stakeholders in understanding and implementing a shared, common vision of science education. As schools narrow their options for standards-based instructional materials, they can make more informed decisions about which materials to select.

The K-12 Alliance can help your district select its instructional materials for K-8 as well as for high school science. Through a scenario-based training, we provide your teams with sample criteria, rubrics, tools for gathering evidence, and a process for scoring materials. Teams may adopt and/or adapt these tools and resources to their particular context and needs.

Contact the K-12 Alliance main office or your regional directors for further information and to set up training sessions.

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IS THE COACH…CONTINUED FROM PAGE 3

the team discovered that the concept really was a smaller idea, not needed for the grade level, or aligned to the standards. We decided to eliminate a part of the conceptual flow that we previously thought was important. Although the lesson was effective, there were more important ideas to bring to the classroom.

- *It's difficult to remain focused on the concept.*

As a facilitator of collaborative work, I find it a necessity to ask questions that keep teachers planning and reflecting on the concept at hand — but it's sometimes extremely difficult to find and ask those questions.

By asking reflective questions, I have to consider the pedagogical implications, rather than simply supplying activities for them. I can have them go through the procedures — just like students — but if the conceptual reasoning is missing, learning will not occur, for the teachers, the students or me!

There are more secrets, but that's enough for now. The learning continues for us all.

Michael Coughlin is a Teacher on Special Assignment (TOSA) in the Lodi School District.

CADRE…CONTINUED FROM PAGE 3

I continue to keep up my cadre connections, especially via e-mail. Teachers in the summer session frequently contact me for content expertise — a phenomenon that is new for me. During my "prior to K-12 Alliance solo summer presentations," I offered my e-mail, but teachers did not ask me for help later on down the road.

Finally, our department at the university is interested in expanding work with cadres on a variety of K-16 projects and programs. Cadre work has convinced us that educators are all in this together.

Teachers at all levels have expertise to share with others in the K-16 structure. By looking at education differently, we may be able to find unique solutions to a variety of content issues for students – and give us teachers new insights!

Dr. David Polcyn is the Chair of the Biology Department at CSU San Bernardino.

CONTENT SATURDAY…CONTINUED FROM PAGE 3

Participants had plenty of mathematical conversations that day, many centered on the differences in ratios and proportions. These lively mathematical discussions happened only because participants shared a common activity that simply illustrated mass, density and volume.

Overall, with the talents of the Institute of Higher Learning and CSULB, Garvey teachers had an unforgettable and satisfying professional development outing – not to mention a trip down memory lane being back in a college classroom!

Greta Smith is a Teacher on Special Assignment (TOSA) in the Garvey School District.

OOPS!

The Nov./Dec. issue of What's the Big Idea? contained two editorial errors.

Please note that on page one, Fig. 1 omitted two column headings that should have read: Less Of and More Of.

In addition, Kathy DiRanna's Director's Column was mislabeled.