What's The Big Idea?

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Shop Before You Adopt — Better Strategies For Selecting Science Instructional Materials

(Editor's note: This is the second article about selecting instructional materials. In our last issue, we presented Analyzing Instructional Materials – AIM—developed by the K-12 Alliance/WestED in partnership with the BSCS Center for Professional Development, as a viable professional development strategy for reviewing and selecting instructional materials.

AIM delivers a process that assists users with pre-screening, paper screening and piloting instructional materials. Through an evidenced-based decision making process — that relies on data collection and locally designed rubrics — AIM users can confidentially select instructional materials that make sense in their context.

In this article, we briefly compare the AIM process to the Curriculum and Instruction Steering Committee – CISC — Science Adoption Toolkit and make the case for both a paper screen and pilot before purchasing.)

Stop! Only read this article if you are:

- responsible for facilitating your school, department or district instructional materials adoption committee,
- a member of your school, department or district instructional materials adoption committee, and/or
- a teacher who will use the materials selected by your school, department or district instructional materials adoption committee.

With 11 different science programs available to California schools during the 2007 adoption cycle, all of us involved in K-8 science education will need a way to navigate through the myriad of available choices.

Not only must we select the most appropriate science instructional materials but also the most appropriate selection process.

For those interested in a national perspective, two sources can be of assistance: National Research Council (1999) Selecting Instructional Materials: A Guide for K-12 Science and the American Association for the Advancement of Science, Project 2061 Textbook Evaluation Reports (www.aaas.org/publications/textbook/default.htm).

Closer to home, two other processes can be most useful. The first is the K-12 Alliance/WestEd's AIM process (see December 2006 *What's The Big Idea?*); the second is the Curriculum and Instruction Steering Committee's (CISC) Science Adoption Toolkit. Here is an overview of both:

Analyzing Instructional Materials (AIM)

AIM is a professional development strategy in which teachers collaboratively gather evidence of locally identified criteria. They analyze that evidence using rubrics which include: science content, work students do, assessment and work teachers do.

Through the paper screen process, the most promising materials are selected for the pilot. Pilot evidence is then analyzed with two rubrics: student understanding and teacher implementation (see Figure 1, right). AIM recommends piloting of instructional materials **AFTER** the paper screen process and **BEFORE** selection.

AIM is a professional development strategy that goes beyond the normal "checklist" review done by separate committees or individuals working in isolation. AIM engages all teachers who are to use the instructional materials in meaningful conversations that help develop a common understanding of the instructional materials.

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

One recent AIM user describes how the data collection process caused the selection team to look at instructional materials in a new way, "We kept going back to the concept development sequence, how does it flow together? It really made us think does this connect and focus more on the whole unit rather than the isolated components and I think that is what we looked at before, just things in isolation." (Chapter 4, page 100, JBS Dissertation)

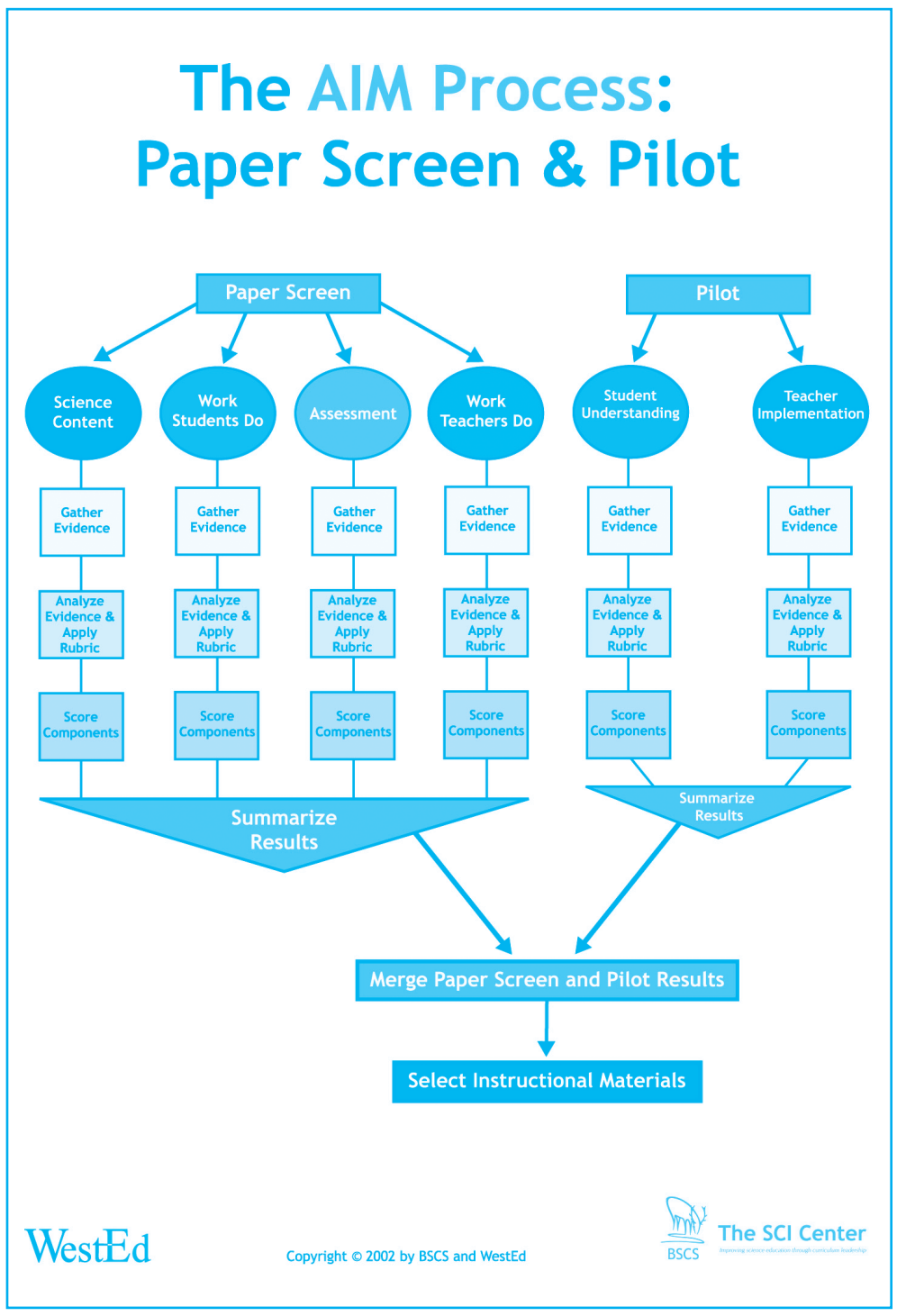


Figure 1

SHOPPING STRATEGIES, CONTINUED ON PAGE 2

IN THIS ISSUE...

Science Adoption Toolkit

The Science Adoption Toolkit, developed by the Science Subcommittee of the Curriculum and Instruction Steering Committee (CISC), is also designed to assist committees in their review and selection of science instructional materials.

Central to the Toolkit are four guiding questions: "What do you want your students to know? How will you know your students know it? How will you make sure your students know it? What will you do if your students don't know it?" (p. 7, Science Adoption Toolkit, 2006)

The Science Adoption Toolkit proposes a three stage process (see Figure 2, page 2) for selecting instructional materials.

Stage One is Developing the District Lens, by which the committee develops a profile of district needs and resources. This stage is critical to making the best selection based on each district's unique needs.

Stage Two is Matching District Needs with Instructional Materials. Here the committee evaluates the instructional materials via four essential components: content, assessment, lesson design and instructional practices, and resources and interventions.

Stage Three is Making an Adoption Recommendation, where the committee compiles the data from

DIRECTOR'S COLUMN

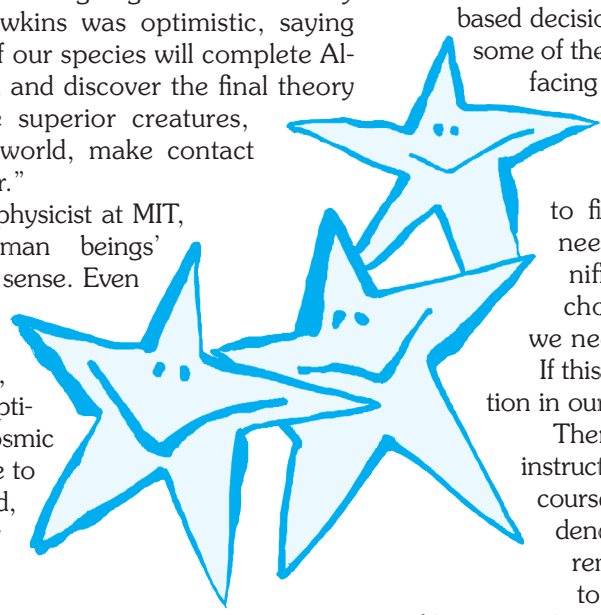
The World – As We Hope It Will Be

BY KATHY DIRANNA

As I was enjoying my last day of "vacation," leisurely reading *The Los Angeles Times*, I came across a column in the Current section entitled: Through Rose-colored Microscopes. It seems that every year since 1966, an online organization named Edge, has e-mailed a question to scientists and thinkers about the state of the world. This year's question was "What are you optimistic about?"

The answers were intriguing. An evolutionary biologist Richard Dawkins was optimistic, saying "that the physicists of our species will complete Albert Einstein's dream and discover the final theory of everything before superior creatures, evolved on another world, make contact and tell us the answer."

Max Tegmark, a physicist at MIT, commented on human beings' smallness in a cosmic sense. Even though it makes him feel rather insignificant, he states, "I've turned more optimistic about our cosmic significance. I've come to believe that advanced, evolved life is very rare, yet has huge growth potential making our place in space and time remarkably significant."



James O'Donnell, a classicist and cultural historian at Georgetown University makes the point that history repeats itself with the same stupidities, the same vengeances, but that dumbness never lasts. "The discoveries of scientists, the inventions of engineers, the advances in the civility of human behavior are surprisingly durable," he says. "Too few students may master the natural sciences, but the understanding enshrined in Newton's laws of motion and calculus is not going away."

Human genome decoder, J. Craig Venter is also optimistic saying "that one of the key tenets of scientific investigation — evidence-based decisions-making — will be extended to all aspects of modern society." Importantly, Venter declares, "We need to push harder for an education system that teaches evidence-based decision making…as we attempt to tackle some of the historically most difficult challenges facing the future of humanity."

These wise humans give me hope.

We need to continue to explore to find the theory of everything. We need to know that we are not insignificant. We need to know that dumb choice and polices never last and that we need evidence-based education.

If this isn't a call for quality science education in our systems, I don't know what is.

Therefore, I'm optimistic that with new instructional materials, we can set the course of science that is inquiry and evidenced based. I'm optimistic that current policies that deny students access to science while they wither in hours of literacy-only programs will fold.

Yes, I'm optimistic that we have a place in the universe that can be positive. And most of all, I'm optimistic that with talented teachers, dedicated to facilitating their student's understanding and achievement and to recognizing that every student is our future, we can discover the theory of everything.

Happy New Year to us all.

SHOPPING STRATEGIES, CONTINUED FROM PAGE 1

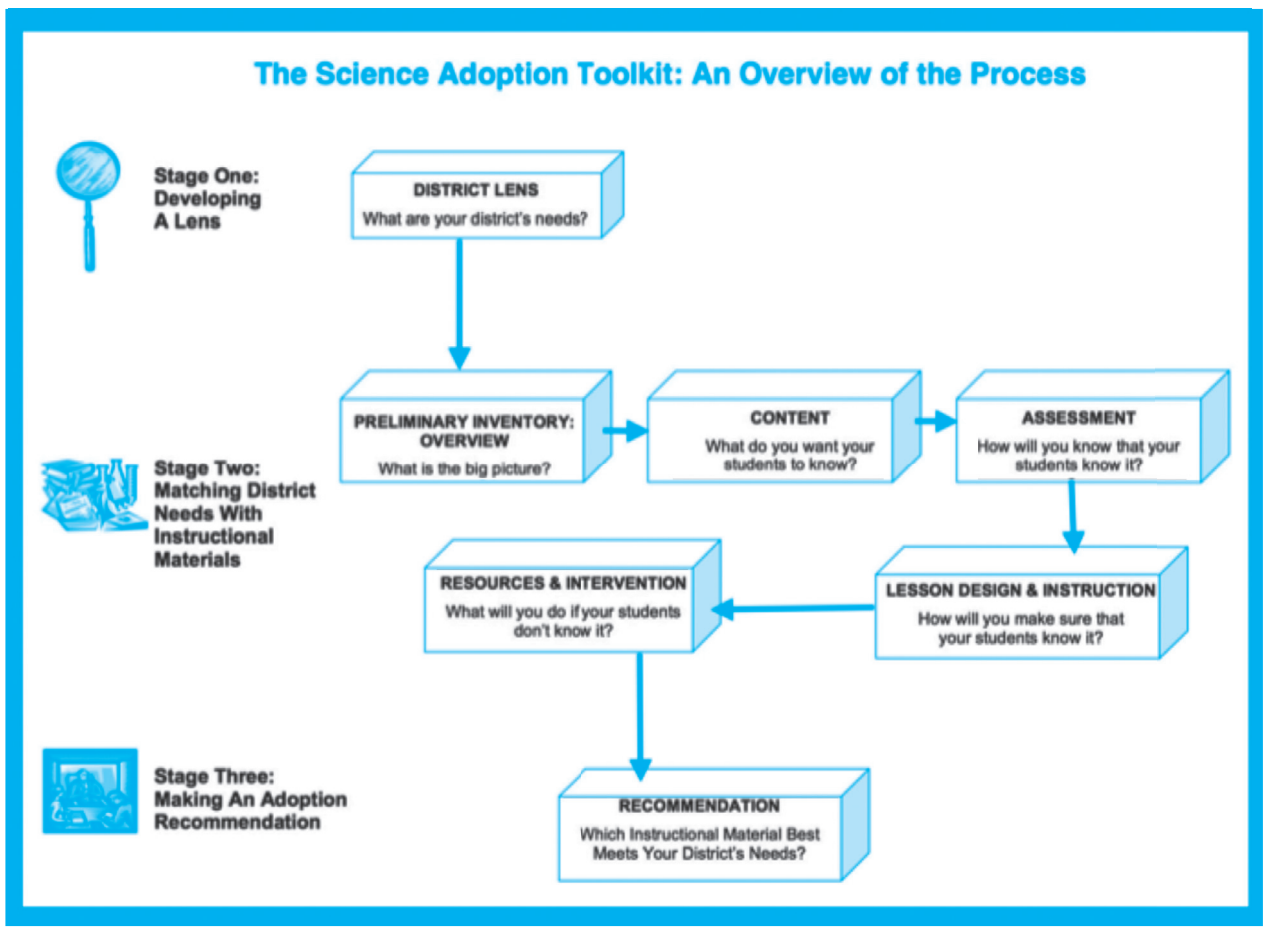


Figure 2

Stage Two to make their final recommendation (p.9, Science Adoption Toolkit, 2006).

Comparison

Figure 3 (on page 4) is a brief comparison of the major features of the AIM Process and the Science Adoption Toolkit. Both assist users with: establishing criteria based on district needs, identifying major components and/or criteria, use of data collection tools, rubrics, scoring sheets, and suggestions for piloting. Facilitation guides are also available for both processes. Both processes can support each other.

While each process has its own strategies, aim and the science adoption toolkit can help support each other. For example, Stage 1 of the Science Adoption Tool kit helps to clearly identify the needs of the district through data analysis.

The AIM rubrics provide clarity for evaluating the evidence. In addition, the development of a conceptual flow in AIM helps the selection committee grasp the totality of the instructional materials rather than isolated components.

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LEADERSHIP

Leadership – It's The People!

BY RITA STARNES

Me? A leader? I suppose we all tend to ask ourselves that question. But think about what Julian Weisslgass Mathematics Profession at UC Santa Barbara and director of Equity in Mathematics Education Leadership (EMLE) says: "Leadership is taking responsibility for something you care about."

Hmm…why then, yes! I guess I am a leader — along with all my peers in K-12 Alliance.

And what a team we are! People first, innovation second.

It's hard to believe that 20 years have gone by since I met my 24 other colleagues. We were the first set of CSIN staff developers in the state! We were all learning together and creating with our leader Kathy DiRanna.

Being full time teachers in the classroom, we were naturally concerned about our "charge." How were we going to invent more time to accomplish our great dream of professional development? But somehow we did. The answer came easy: we did what we did because of the people — a nurturing and supportive team.

And me? My trip from classroom teacher, to staff developer, to Regional Director was also filled with adventure, comedy and mystery all rolled up together. The decision to become a Regional Director meant a great change. I had to consider giving up tenure, asking for a leave, foreseeing the future. You know, the simple things in life!

We were very nervous at our first Regional Director meeting when Kathy DiRanna shared some of the possible views to the future. We could only see a few months ahead and funding was unsure. It felt a little impossible, still, I felt inwardly confident. I remembered the movie *Gumball Rally*, about a race across the United States in cars with no designated route. An image popped into my head.

As one driver zooms along the highway, he reaches up, rips off the rear view mirror and throws it out the window. "What did you do that for?!" exclaims the passenger. Driver: "When you are planning to win the race, it doesn't matter what is behind you, it's important to be prepared for what's ahead."

So true! The K-12 Alliance has always looked ahead, preparing positively to meet the challenges of the road. This organization continues to be a great learning trip with competent and wonderful people. That is why I am proud to be part of the team. I am with motivated people who want to work, to change and to be the best.

Finally, I'd like to share two favorite quotes that keep things in perspective for me:

Author Margaret Wheatley refers to motivation theory in her book *Leadership and the New Science*. "Our attention is shifting from the enticement of external rewards to the intrinsic motivators that spring from the work itself," she explains.

Another favorite quote is from author Susan Loucks-Horsley from her book *Leading Every Day*. She writes: "Recognize that how you go about learning is an act of symbolic leadership that will not go unnoticed. Others will observe how you approach lifelong learning and will learn from your behavior. You are a role model even though you may not be aware of it."

TEACHING & LEARNING

Pigs Can Fly… And Talk And Build Houses And Shop At The Mall…

BY SUSAN GOMEZ-ZWIEP AND WILLIAM STRAITS

Could Charlotte really write in her web? Does Snoopy really think he's flying a plane atop his doghouse? And just how famished is the Hungry Little Caterpillar?

Concerned that the anthropomorphism found in most animal stories may mislead young learners, the AAAS (American Association for the Advancement of Science) offered some guidelines for educators, noting that by the end of the second grade, students should know that stories sometimes give plants and animals attributes they really do not have (AAAS, p.102).

But all is not lost for science teachers, even though these young students will continue to read books about worms attending school and pigs building houses. You see, anthropomorphic texts can provide great opportunities for meaningful scientific learning, while developing students' understanding of different kinds of texts.

Analyzing Anthropomorphisms – A 5E Lesson Plan

To start, gather up non-fiction and fiction books related to a particular animal for each group of students. You may want multiple sets so all groups can discuss the same animal or sets related to different animals for each group.

(1) Engage

Begin with a class discussion by reading out loud amazing features of animals — some factual, some fiction. After each is read, ask students if they believe the attribute to be true or false.

For example: "Reindeer keep warm by eating a type of antifreeze." (True — the moss they eat contains a chemical that keep their body fluids warm. The moss itself offers no nutritional value.)

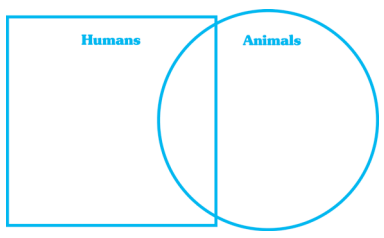
Students will begin to think about the incredible things they have heard or read about animals and will learn how to tell which ones are true. Disagreements and minor debates are all part of the discussion and, in fact, the overall process.

During a pre-assessment period, students select or are assigned an animal. Working in teams of 3 or 4, students will record everything they know about their animal on individual sticky notes. These sticky notes are placed on chart paper to create a map showing how their ideas are connected to demonstrate current thinking.

Students can also write their maps directly on chart paper, but sticky notes allow students to move ideas around as their ideas change during the group's discussion.

(2) Explore

The next step is to distribute the collection of books to each student team. Students then create a chart listing characteristics of their animal from the various texts. These characteristics can then be placed in a graphic that separates characteristics that describe humans (square) from characteristics that describe the animal (oval). The characteristics common to both are placed on the chart where the circle and square overlap.



PIGS CAN FLY…CONTINUED ON PAGE 4

COLLABORATION

Bridging Connections

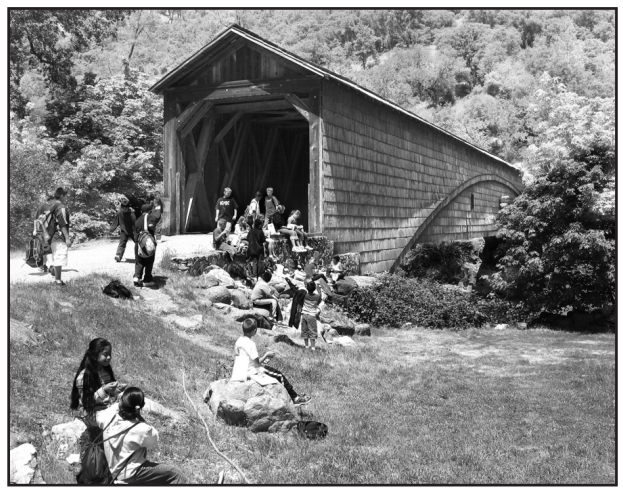
BY DAVID PUMMILL

Teachers and students are finding common ground in Yuba County where a structural bridge is making connections between science, math, architecture and art.

Yes, a bridge — namely a covered bridge that happens to be the longest single span covered bridge in the world. Located in the Bridgeport State Park, this bridge is the center of a partnership between the Marysville Joint Unified School District (MJUSD) with the Nevada County Superintendent of Schools office (NCSoS).

Awarded a California Math and Science Partnership grant in the 2006/2007 school year, the MJUSD worked with NCSos to develop two unique programs: "Science Success for All" and "The Bridge Project."

The idea was to bring teachers and students to visit the Bridgeport Natural Science Center on the Yuba River for an outdoors classroom experience. The results have been not only photogenic but educationally inspiring.



LUNCHTIME AT THE BRIDGE — Don Fry's fifth graders from Ella Elementary School in Olivehurst MJUSD check out the surroundings. Don is a Science Staff Developer for "Science Success for All."

"The Bridge Project" was designed to cross county lines to link students and educators in schools in the Yuba River Watershed. The project also established a network of schools, students and educators in Nevada and Yuba Counties that use the Global Learning and Observations to Benefit the Environment (GLOBE) Program to regularly gather and share watershed data.

ACADEMIC PARTNERS — Students from Alicia Intermediate School in Yuba County work together with their peers at Seven Hills Middle School in Nevada County.

Students from both schools rendezvoused at the beginning of the school year at science center, and plan to keep in touch throughout the school year.

In addition to learning about hydrology, students are doing their own research – they are measuring oxygen content and other water quality factors, using GPS devices to pinpoint spots where water samples were collected.

Since the beginning of the academic year, students have been taking water samples from the Yuba River near their own schools. Since these locations are about

BRIDGING CONNECTIONS…CONTINUED ON PAGE 4

SHOPPING STRATEGIES, CONTINUED FROM PAGE 2

Comparison of the AIM Process and the Science Adoption Toolkit

Selection Process	Professional Development Strategy	Pre-Screen	Establish Criteria Based on District Needs	Major Criteria or Components	Data Collection Tools, Rubric, Scoring Sheet	Recommendations for the Pilot	Facilitation Guide
AIM Process	✓	✓	✓	•Science Content •Work Students Do •Assessment •Work Teachers Do •Student Understanding •Teacher Implementation	✓	After the paper screen	✓
Science Adoption Toolkit			✓	•Science Content •Assessment •Lesson Design and Instructional Strategies •Resources and Intervention	✓	Before or after Review	✓

Figure 3

A Need and a Plan for Piloting

A major difference is that the AIM process, as a professional development strategy, includes a pilot AFTER the paper screen and BEFORE selection. In this way, AIM goes beyond the selection of materials to the implementation of materials.

AIM suggests that analyzing instructional materials is somewhat like an interview process in which the paper screen results in the best candidates that meet the given criteria. However, the selection can not be completed unless the materials are subjected to the real world of the classroom. In other words, the materials have to be taken for a "test drive."

Contrary to current pilot practices — when teachers develop an affinity or hatred for the materials they are given to pilot — the AIM pilot is done AFTER the paper screen. The committee has already agreed on what makes quality materials. The pilot is done only on the top rated materials from the paper screen. And the AIM pilot is still evidence based; opinion is not a criteria!

Pilot teachers, representing a broad cross section of teachers, use comparable sections of the materials in their classroom and gather evidence in terms of student understanding and teacher implementation. For example, using AIM tools, the pilot teachers gather student work in a pre-assessment (what do students know before they begin a unit?); from several learning experiences (e.g., investigation, activity, reading, assessment); and finally from a post-assessment.

Teachers bring their student work to committee meetings and using rubrics score the work. They also gather data from students shedding light on which of the materials helped them learn most effectively. This unique tool helps teachers understand how the materials work from a student point of view.

Additionally, teachers use AIM tools and rubrics to determine how well the materials support teachers in the use of the materials. Are there support items such as background information, assistance with student misconceptions, pointers to setting up labs, assessment rubrics, quality ancillary materials?

Teacher support is scored as comprehensive, average or minimal based on the criteria. Scores from the pilot are added to scores from the paper screen (see Figure 4, below) and a final decision is reached.

Because AIM causes teachers to thoroughly analyze materials in the paper screen and in the pilot, the district now has a group of teachers who are very familiar with the instructional materials. Through discussion of the data, the materials review and pilot teachers help identify implications for future professional development for quality implementation of the materials.

Go Slow to Go Fast

What ever process you ultimately select, take your time in reviewing the instructional materials — it's not a process to be rushed.

Designing Professional Development for Teachers of Science and Mathematics (Loucks-Horsley, et al., 2003) suggests that a collaborative, clearly articulated procedure that addresses all aspects of the selection process is essential to quality selection. Having experienced the AIM professional development strategy, teachers say they will never look at learning, teaching or the role of instructional materials in the same way again.

For additional information about the AIM process, contact your local K-12 Alliance Regional Director or our main office. For additional information about the Science Adoption Toolkit, contact your county science coordinator.

The AIM Process:
Combining the Paper Screen and Pilot Scores

Score Sheet for AIM Process: Paper Screen

Criteria/Component	Score	Weight	Weighted Total	Percent
CONTENT				
Standards Alignment				
Accuracy				
Readability				
Concept Development				
Sequencing				
Content				
TOTAL Content Criterion		X 0.40	=	
WORK STUDENTS DO				
Quality Learning Experiences				
Abilities Necessary To Do Scientific Inquiry				
Understandings About Scientific Inquiry				
Accessibility				
TOTAL Work Students Do Criterion		X 0.20	=	
ASSESSMENT				
Quality				
Multiple Measures				
Use of Assessments				
Accessibility				
TOTAL Assessment Criterion		X 0.20	=	
THE WORK TEACHERS DO				
Instructional Model				
Teaching Strategies				
Teaching Strategies for Inquiry				
Support for the Work Teachers Do				
TOTAL Work Teachers Do Criterion		X 0.20	=	
GRAND TOTAL (Paper Screen)			T=	T/24 X 100 =

Score Sheet for AIM Process: Pilot

Criteria/Component	Score	Weight	Weighted Total	Percent
STUDENT UNDERSTANDING				
Pre-Post Assessment of Unit Concept(s)				
Investigation				
Active learning (Activities				
Reading				
Assessment				
Total Student Understanding		X 0.60	=	
TEACHER IMPLEMENTATION				
Content Background				
Teaching Strategies				
Teaching Strategies for Inquiry				
Assessment Strategies				
TOTAL Teacher Implementation		X 0.40	=	
GRAND TOTAL (Pilot)			T=	T/23 X 100 =

(0.6) (pilot score) + (0.4) (paper screen score) = Total Score

Figure 4

PIGS CAN FLY… CONTINUED FROM PAGE 3

(3) Explain

Once students have had a chance to discuss their readings and sorted characteristics, they will re-evaluate their map. They can rearrange their concepts, add new ones, revise concepts, and modify the links between them. Sticky notes can again be useful to help track student thinking. As students re-evaluate their concept map, any new concepts or links can be shown with a different color of pen or sticky notes.

Once the concept maps have been discussed, direct the students to the "human" side of the chart and explain that giving human-like characteristics to their animals is called anthropomorphisms. Students can then brainstorm possible reason why anthropomorphisms are used in some fictional texts.

(4) Evaluate (or post-assessment)

Once the concept map has been revised, the students will communicate their understanding of their animal to the class. This can be done through a "wanted poster." The main portion of the poster should depict and accurately describe the animal they discussed, integrating information from their concept map. However, the lower portion of the poster should be saved for an "also known as" section where students can place samples of anthropomorphic characteristics they noted from their fictional texts.

(5) Extend

Students can now create their own fictional story and non-fiction accounts of another animal. At this point you can allow them more freedom about what topic they choose and how they gather information about their animal. Students may use reliable Internet sites, videos or even by making observations of live animals.

Students may also wish to present their fictional and non-fictional accounts through oral presentations, mini-plays or by creating their own fiction and non-fiction book sets that can be shared and read by their classmates.

William J. Straits and Susan Gomez-Zwiep are Assistant Professors in the Science Education Department at California State University, Long Beach. Susan was previously a staff developer from Montebello USD and has served on life science cadres.

BRIDGING CONNECTIONS… CONTINUED FROM PAGE 3

OUTDOOR LEARNING — Students are sharing data with each other…and the world.

50 miles apart, their findings can vary noticeably.

The data collected by the students is shared over the Internet on the GLOBE website (www.globe.gov). Students publish their research projects using GLOBE data and protocols while collaborating with scientists and other GLOBE students across the country and worldwide.

Nevada and Yuba Counties students will continue to gather data through the end of this school year. This sustainable partnership will keep going through a collaboration of the MJUSD and NCSoS even after the grant funds have been depleted.

Overall, the partnership has given teachers and students valuable hands-on science experiences in addition to offering many children who live in a semi-urban environment, a chance to visit a river they usually only see from a freeway bridge.

David Pummill is the program director for Marysville Joint Unified School District's California Math and Science Partnership, "Science Success for All."