What's The Big Idea?

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Going Beyond "Answers May Vary" Through Expected Student Responses

(Editor's note: This is third in a series of articles about Assessment-Centered Teaching (ACT), a product from the Center for the Assessment and Evaluation of Student Learning (CAESL) funded by the National Science Foundation. CAESL is a collaborative partnership of WestED; the University of California, Berkeley's Lawrence Hall of Science and Graduate School of Education; University of California, Los Angeles's National Center for Research and Evaluation and Student Standards (CRESST); and Stanford University.

Here, we provide an overview of developing Expected Student Responses as foundational to creating scoring rubrics for evaluating student work. A more complete description of this process can be found in the soon-to-be released book, "Assessment-Centered Teaching: A Reflective Practice," Corwin 2008.)

Have you ever been frustrated with the "Answers May Vary" statements in the answer key of your teacher's edition? Are you tired of keys that only state correct answers? Are you looking for ways to understand what your students know and where they are struggling in gaining conceptual understanding? Developing Expected Student Reponses (ESRs) helps veteran and novice teachers anticipate the full range of student understanding and plan for better instruction and assessment.

Equipped with an Assessment Plan developed via the Conceptual Flow and the Record of Assessments in Instructional Materials (RAIM), (See November, 2007 WTBI) assessment-centered teachers are ready to look at assessment items and predict the different ways their students may respond to questions and prompts.

Expected Student Responses are best created with colleagues; together teachers generate ESRs or student answers to a specific prompt. When constructing ESRs, teachers must think beyond scoring student work simply as either "right" or "wrong" or "answers may vary." Teachers need to address specific content and determine responses that represent a wide range of student thinking. Teachers begin by writing complete and optimal student responses that indicate achievement of the learning goal. They then consider the full range of student understanding of the learning goal and reflect on what a middle- and low-level understanding would be.

Table 1.a Pre and Post-Assessment (Item #18) FOSS Earth Materials

A student found a pretty stone in the park near her home. She wasn't sure if it was a rock or a mineral, so she took it home to try some tests. Below are the observations she wrote in her field notebook.
Date: 4/16/98 Place Found: Larkey Park Observations: • About the size of my fist • Several colors: brown, black, tan, and white smooth round pieces stuck in what looks like cement (light gray color) • I can scratch the black pieces with a paper clip, and the brown and white pieces with a penny. • When I put a few drops of acid on the cement part, it fizzes Conclusions: I think this is a rock.
List at least three things from the student's observations that would convince someone else that the pretty stone from the park is a rock, not a mineral.

In developing ESRs, assessment-centered teachers evaluate whether an item will elicit a full range of student understanding at their grade level and if alternative conceptions will be revealed. Teachers often find this a difficult task for pre-test items. For example, while students may have limited prior knowledge of a concept at the time of the pre-assessment, teachers still need to write ESRs that reflect a high level of understanding.

Often, teachers assume published instructional materials always contain quality assessments. It is important for assessment-centered teachers to recognize that evaluation and, if necessary, revision of assessment tools (both task and scoring guide) are critical to designing quality assessment plans. Even if scoring guides or rubrics are available in the instructional materials, it is extremely beneficial for teachers to develop ESRs. Teachers can compare their ESRs with the published scoring guides and make revisions accordingly.

Tables 1.a and 1.b illustrate ESRs developed by CAESL teachers who were using the Earth Materials (FOSS, 2001). The task for the pre-assessment and post-assessment (Table 1.a) is designed to measure students' understanding of the similarities and differences between rocks and minerals.

The ESRs (Table 1.b) indicate both quantitative and qualitative differences among levels of understanding. A high response includes a students' knowledge that rocks are made up of minerals, tests can determine the presence of minerals, and there are variation among rocks. The low response indicates confusion about the role of shape or color as for a distinctive characteristic of a rock or mineral or absence of evidence to support the ideas.

ESRs are a preliminary scoring framework for assessment. After teaching a section of the conceptual flow, teachers gather and analyze student work. Linking ESRs with the student work gathered during instruction and assessment is the first step in creating a scoring guide that represents the full range of student understanding.

Table 1.b Expected Student Responses (ESRs) for Assessment #18

Expected Student Response		
What do you expect students to know? Write the full range of ideas and understandings for your students.		
High	**Medium**	**Low**
Student clearly notes the difference between a rock and a mineral by stating that rocks are made up of minerals and identifying at least three of the following properties to support the answer: • There are several colors in the same rock. • The rock samples have pieces stuck together; minerals have only one component, so you don't see different pieces. • The different rock samples show different scratch results. • Fizzing indicates that calcite, a mineral, is a part of the rock sample. Only a part of the sample fizzes.	Student identifies the object as a rock or mineral and identifies at least one of the following properties to support the answer: • There are several colors in the same rock. • The rock samples have pieces stuck together; minerals have only one component so you don't see different pieces. • The different rock samples show different scratch results. • Fizzing indicates that calcite, a mineral, is a part of the rock sample. Only a part of the sample fizzes.	Student describes characteristics of the sample (rock or mineral, e.g., a rock cannot be flat, but a mineral can, or minerals have many colors and rocks do not) but provides no support that shows understanding of properties of rocks or minerals. No mention of: • The sample has several colors. • Pieces stuck together and that minerals have only one • Different results from the scratch test of the samples. • Fizzing to indicate calcite as an ingredient.

Guided by their preliminary ESRs, teachers place the student work into categories of high, medium and low responses. For example, an ESR for a "low" response may suggest how students with an incomplete understanding of a concept might respond. As teachers attempt to match the student papers with the ESRs, they make notes about characteristics of the different levels of responses. If they find responses that do not fit the preliminary ESRs, they can create additional levels and note the relevant characteristics.

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DIRECTOR'S COLUMN

If I Was 'God'

BY KATHY DIRANNA

It's weird to think of New Year resolutions, when one is writing at Thanksgiving, but I guess both holidays are a time of reflection, taking stock of what matters to you and thinking forward along a line of continuous improvement.

New Year…what might the future be. What if I was the "god of education" and could create things my way? I started my list.

- Teaching and learning would be the most exciting adventure humans could have.
- Education would be about education, not politics.
- Science would be core in every school for every student. No if, ands, or buts, about it.

Then I thought….Thanksgiving. How blessed I've been with colleagues (teachers, researchers, professional developers, district and county coordinators, university faculty) who have contributed to our efforts throughout the years.

I asked them the same question — what would they do if they were the god of education? I found their thoughts fascinating and insightful.

Vision/Policies

I would substitute all the current decision makers who do not have The Vision with folks who do have the idea of "what really works."

I would stop everything we do and start from scratch with a new design for educating people. The factory model is so 19th century! Since we can't do that, I would look carefully at what kids pay attention to and start with them. "Listen to kids; they tell us everything we need to know about education."

Have all legislative members serve at least a required 1 month internship in an urban/rural school to shadow and assist in as many duties as a teacher and/or administrator have to do, from planning to teaching, to 'playing mom, social worker, nurse, counselor, change agent, problem solver, community relations, etc.,etc.,etc… Perhaps then, we'd have more insightful decisions and policies to impact education positively

I'd bring some sanity to the accountability system and figure out a way to end the confusion between accountability and assessment for learning. Place an emphasis on using assessment in service of learning and involve students in the process. As Stiggins would say, help students and teachers answer three questions: 1) Where am I going; 2) Where am I now; and 3) How do I close the gap.

I would edit the existing Ed Code to "require" weekly instructional time for science at all grade levels and increase high school science graduation requirements to 3 years. I would also want legislation that would treat all core subject areas equally on school program reviews, SAIT, distinguished school visits, STAR test weighting, etc.

I'd implement a teacher training corps that place college-age, teacher candidates in classrooms with follow-up classes to debrief the work they are doing and provide new skills and ideas to implement.

Time to teach and learn

Teachers would work collaboratively and seamlessly; practice would be deprivatized. Teachers would teach no more that 3 or 4 class periods and receive full time pay. There would be ample time to plan, review student work, gather needed supplies to set up labs.

I'd make the teaching a full year job with one-month vacation and an appropriate pay increase to compensate for the extra work time. This would give teachers time for collaboration, lesson study, data analysis, etc. Students would also go 11 months but would have special art and music, museum classes during the extra school month.

Every three years, teachers would rotate out of the classroom into a tutoring/coaching position for a year and then go back to the same teaching assignment. While on the tutor/coaching year, teachers would participate in lesson studies, curriculum workshops and even make some home visits.

Keep improving the ways teachers talk to each other. The reason? Because how they talk to each other about their own craft centered around student work determines how well they do in their class. Teachers who talk effectively together are more effective than any teacher who is solitary.

Funding

I think I would remove money from the education equation. It should never be a factor when we are talking about what is best for children

I'd double teacher salaries and then create a tenure and reward system based on merit rather than seniority. I'd attract more of the best and brightest, the ones who would love to teach but feel they have to choose other careers because they need to think about their own families.

Then I'd reward the teachers who work the hardest, teach in the toughest neighborhoods and do the best work….

Instead of paying them $100 a day and a canvas bag to give up their summers and weekends, I'd reward them handsomely – make an example of them, so that everyone else would stop thinking they're crazy for going above and beyond.

I would restructure funding. Under the banner of providing "equal" funds to all schools, average salary is used across the board to fund districts and schools. In reality, schools with struggling students typically have novice staff. Therefore, nothing is "equal" about the distribution of funding to these schools.

In actual money terms, struggling schools' funding is far less than schools with more experienced teachers. What's equal about paying the district average salary to a first year teacher? It's the dirty little secret in education that continues to fuel the haves and have-nots in the system.

Resources

I would tear down all the schools and build state of the art buildings with state of the art, working technology (e.g., work out rooms and equipment for PE; art auto shop, TV and movie production and performing arts; music including singing and recording studio science lab rooms with all the necessary and functioning equipment). After all, our prisons have this much.

Community

I would require all citizens visit their local public schools. Take a tour and take photos to share with others. Observe in classrooms. Talk with teachers, students, administrators and parents about what is most special and positive and productive in their schools, and what are the challenges, including the insurmountable challenges. As they leave, ask them to reflect in writing what they've learned and how they personally can contribute.

Involve all parents in the school community.

Now there's a future!

So, if you were the "god of education," what would you do? ■

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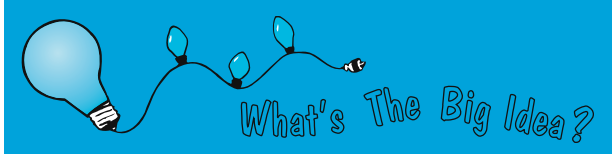

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LEADERSHIP

Live, Learn And Teach

BY MICHAEL HARRIS AND KATHLEEN JONES

Little did we know as we sat down at our first CSIN (now K-12 Alliance) Summer Training 14 years ago, an abundance of learning opportunities would be waiting for us. Since that illustrious moment, our teaching and leadership careers have flourished.

Through the years, the K-12 Alliance has kept us abreast of current research and best practices. Bringing in authors and leaders in the areas of content, instruction, assessment and how people learn have helped us improve our teaching practices as well as assist colleagues.

As we used content knowledge, research and best practices in our own classrooms, we found leadership opportunities in our district and region. Our knowledge – with the support of the K-12 Alliance – gave us credibility in our district to head up the science task force so we could evaluate science materials and lead monthly science professional development courses throughout Northern California

That experience ultimately led to district officials asking us to oversee a four-year grant benefiting district teachers in grades 1-6. Now instructors could collaborate and write science units with frontloaded lessons for language learners as well as integrating language arts skills and other content areas where appropriate.

CHINO PARTNERS — Kathleen Jones (left) and Michael Harris have worked together on district committees and curriculum councils.

To this day, we are grateful for the feedback of fellow teachers. They have said our workshops have positively influenced how they teach and what they teach.

The K-12 Alliance helped us prepare for the ramifications of the No Child Left Behind legislation. We knew our students deserved more than us teaching for just a test score. A pared-down curriculum of only two subjects (math and reading) was unacceptable.

As we served on district committees and curriculum councils, we were never silent. The solid foundation we received from the K-12 Alliance provided us with a voice of reason among those who were so easily swayed by the pressure for high-test scores.

Every year is a new year with the K-12 Alliance. As the organization holds true to its guiding principles, it is ever evolving in current practices and research, indicative of an organization that seeks continuous improvement.

As professional educators, we are indebted to all we have learned and acquired about the education of young people. Our on-going affiliation with the K-12 Alliance gives us strength and credibility as curriculum leaders in this very politically- charged educational environment. ■

Michael Harris is a kindergarten teacher at Rosedale Elementary School in Chico;

Kathleen Jones is a second grade teacher at Shasta Elementary School in Chico.

TEACHING & LEARNING

It's Not Rocket Science…Or Is It?

BY JACKIE GALLAWAY

I have a confession: I am a transplanted scientist. I didn't start out as a scientist; the process was a forced metamorphosis. In the early '90s, my school district was downsizing and my principal "asked" if I would like to teach science. The unspoken understanding was teach science or find employment elsewhere. Yikes! Thus, began one of the great adventures of my life.

Up to that time, I had taught language arts for 5 years. My transformation took 3 years to complete. I went back to school and received my Master of Arts in Teaching Science from California State University at Fullerton (CSUF) and joined an organization you may have heard of: the K-12 Alliance.

Upon graduation, I helped write a proposal, which eventually funded a Science Center at my school, Bell Gardens Intermediate (B.G.I.). Later, two partners and I were awarded a grant for $100,000, which enabled us to gather data from around the world to share with our students through lessons on energy and astronomy.

I hope this long-winded introduction gives perspective when I enthusiastically support the motto, "Science is the best friend literacy ever had!" uttered by John Myers, esteemed science facilitator and consultant for Montebello Unified.

For my EL students, this has proved to be especially true. All of a sudden, language arts students magically changed from some of the lowest achieving students to some of my best students in science. Why was this true?

It's not rocket science (well, kind of!) but presenting science as engaging and relevant for students naturally takes off on its own. I discovered hands-on experiences provided students the necessary "realia" for them to access academic vocabulary and subject content.

Another factor is the inherent need for collaboration in science; a key component for EL students in understanding content as well as developing confidence in their ability to communicate.

To further improve the literacy of my students, I mandate they create interactive science notebooks. My students' learning experiences are kept in a science notebook, which requires note taking, reflection and summary statements.

I've been passionate about science journals since I wrote my thesis at CSUF. One study I found, Gaskins, et al. (1994), presented data to support the argument that writing can improve several types of thinking skills related to science education.

Overall, students using Writing-to-Learn strategies are more aware of language usage, demonstrate better understanding and recall, and show more complex thinking about content.

Expository writing tasks such as explaining, note taking and summarizing are effective strategies. Keep in mind, in order to be effective and doable for EL students, all this writing is employed in a conceptual, hands-on curriculum.

Soon, B.G.I. will host its tenth Family Science Night. About 350 students and parents will conduct experiments while teachers will explicitly make literacy connections. Thanks to the magical and engaging power of science, our students will improve their literacy skills while having a blast – for some, that maybe literal! ■

Jackie Gallaway currently teaches sixth grade at B.G.I. and a science methods class for California State University Long Beach.

COLLABORATION

Lake County Goes Rock Hunting

BY CINDY USTRUD

Rock stories, plate tectonics and the water cycle were topics covered in a weeklong Lake Science Collaborative Institute this summer for 36 teachers representing every district in Lake County. The Collaborative is one of California's Math-Science Partnership grants.

Taking place at UC Davis McLaughlin Reserve, the institute was the second activity in a yearlong series, the Science Collaborative Project, which focuses on increasing teacher knowledge in science content directly related to science standards in grades 4-6.

Presenters for the institutes were Matt James, Sonoma State University Geology Professor; Candy Tkachenko, Mt. Vista Science Teacher; Cathy Koehler, McLaughlin Reserve Manager; Tappy Nelson, Cobb Mt. Elementary School teacher; and Al Janulaw, Sonoma State School of Education Liaison.

Teachers learned about identification of rocks and minerals, formation of igneous, metamorphic and sedimentary rocks interwoven with plate tectonics, water and weather cycles.

MAKING WAVES — Creating an "ocean in a bottle" are (from left): Valerie Duncan, Upper Lake Middle School; M. Shane Lee, Pomo School; and Stella Winckler, Lucerne School.

In addition, teachers previewed the new science textbooks and began to develop a map of "Big Ideas" to bring back to their classrooms.

Reviews from the institute were outstanding!

With engaging and entertaining presenters, teachers engaged in hands-on activities that were easily and inexpensively taken back to their students in discovery-based science learning labs.

Participants also had the opportunity to go out into the field at the reserve, chip away at rocks and collect specimens. Michelle Malm, Kelseyville USD Foods Director, received accolades on her daily breakfast, lunch and snacks.

This fall, teachers went on a recent field trip to Sonoma County, lead by Matt James, Sonoma State Geology Professor, to reinforce concepts learned regarding rock and mineral identification and to view topography where the interface of the Pacific plates occurs. The teachers actually stood on two of earth's plates and witness firsthand the impact of plate tectonics.

During the school year, teachers are also engaged in the Teaching Learning Collaborative. Jody Skidmore Sherriff, K-12 Alliance Regional Director, facilitates the planning, implementation and debriefing of these collaboratively planned lessons.

Grade level collaborative groups meet in the fall and spring to plan a lesson using the 5 Es Instructional Model. The teachers then teach the lesson in two classrooms from each collaborative group. Teachers analyze and reflect on the lesson and have the opportunity to fine-tune their craft before teaching to the second classroom.

LAKE COUNTY, CONTINUED ON PAGE 4

Back To Our Roots

The K-12 Alliance is reaching back to its roots of the late 1990s with a newly funded program benefiting primary science education in Montebello and Garvey School Districts.

The California Post Secondary Commission has awarded CSU Long Beach, in conjunction with Montebello Unified and Garvey School Districts, and the K-12 Alliance, funding for a new professional development project to help improve science teaching in kindergarten through second grade. It is part of the federal Improving Teacher Quality Program, funded under the No Child Left Behind Act of 2001.

This is an exciting opportunity!

The strength of this project lies in three facets: Building on past work, a more direct connection to ELD training by the district and an expanded research component.

The new program builds on the success of the K-12 Alliance professional development design and will send 42 teachers to participate in summer science institutes as well as TLC teams for the next three years.

The summer institutes are coupled with district training in English Language Development (ELD). Building upon the skills they develop during the ELD institute, the participants will have science content opportunities to practice ELD and SDAIE strategies with their students.

In addition, the project includes a significant research component coordinated by Drs. William Straits and Susan Gomez-Zwiep at CSULB. The research project focuses on the program's impact on student achievement and teacher growth. The current research plan includes both quantitative and qualitative research methodologies.

PROJECT LEADERS — Susan Gomez-Zwiep (left) and Bill Straits work together for the new project which targets primary school education.

The quantitative piece uses district ELD and Language Arts assessments to measure growth in those areas as well as instruments developed specifically for the program to gauge both student and teacher growth in science. The qualitative research methods provide a deeper picture of teacher growth during their three years of program participation.

We are thrilled to bring K-2 teachers back into the work we have been doing in these districts. In the last several years, science professional development has focused almost exclusively on 4-8 grade teachers – due in part due to the funding requirements of the California Math and Science Partnership grants.

This new grant now enables the districts to make science a core subject in grades K-8

We are also very eager to bring in new folks from CSU Long Beach, such as Straits who will work both at the institute and as the lead researcher on the project. A native of Southern California and a former K-8 science teacher, he has experience in Appalachian State University in North Carolina as well as the University of Texas, Austin. His research focus has been both on post-secondary and elementary science teaching.

In addition, we are proud that Gomez-Zwiep, a former K-12 Alliance teacher-leader and now professor at CSU Long Beach, will serve as the PI on this grant. In this capacity, she will oversee and contribute to the development and implementation of the professional development program.

Overall, the grant will provide more opportunities for teachers to hone their skills as they set the stage for our youngest students for a lifetime of learning.

GOING BEYOND, CONTINUED FROM PAGE 1

Table 1.c From ESRs to Criteria

Score	Preliminary ESRs	Scoring Criteria
High	Lists 5 characteristics of living things such as: growth, eating food, respiration, need water, response to stimuli, reproduction, elimination of waste, composed of cell(s).	Describes 5 features of living things that go beyond the common features (e.g., needs food, water, shelter, air) and addresses more complex features (e.g., made of cells) uses academic vocabulary where appropriate (e.g., respiration for breathing; reproduction for having babies).
Medium	Lists at least 3 characteristics of living things.	Describes 3 features of living things; the features are the basics (e.g., food, water, shelter, air, grow); uses basic vocabulary.
Low	Lists one characteristic of living things.	Describes one feature OR indicates alternative conceptions such as anything that moves is living; anything that is dead is non-living OR lists body parts e.g., head, arm leg).

Generally, teachers find it easiest to characterize the high- and low-level responses, and more challenging to capture subtle differences between high and medium, and medium and low performances.

Teachers ask themselves: What changes can be made to the ESRs to better capture differences in high-, medium- and low-level responses? How can the ESRs be revised to more accurately reflect the "hard to categorize" student responses?

Sorting and characterizing student work involves teachers moving the student work back and forth between different score point categories as they looked for similarities among student responses.

Discussions with facilitators and colleagues help teachers identify alternative conceptions and learning trajectories not anticipated when teachers first drafted the ESRs. After sorting the work and describing the range of student responses, assessment-centered teachers use these descriptions to finalize the scoring criteria and then score the student work.

Table 1.c illustrates how a group of CAESL teachers transitioned from their ESRs to a scoring criterion. The assessment prompt asked students to: List at least five characteristics of living things. What do they need to have or be able to do in order to survive?

In the next issues, we will discuss how to interpret student work by analyzing patterns and trends found in the work.

LAKE COUNTRY, CONTINUED FROM PAGE 3

TAKING A CLOSER LOOK — At the recent Lake Science Collaborative Institute, educators explored geology. Observing minerals are (from left): Heather Kohler, Dave Geck, Tappy Nelson and Lynn Chick.

Plans are already underway for next year's summer's institute on life science; the following year, physical science. All activities add up to a true collaboration among organizations, people and program.

Project Director Olga Clymire spearheaded the formation of the Collaborative and is pleased with the evaluation so far. Her quest is to continue the funding, but most importantly, the synergy of a dynamic collaboration.

Cindy Ustrud is a Co-PI for the LAKE Science Collaborative.

A Tree Grows In Compton

Students, faculty and community members made Centennial High School in Compton a more beautiful campus by recently planting 36 trees in an otherwise barren urban school. The planting was part of the TreePeople program for Los Angeles communities, which offers training and support for planting and tree care in order to improve local neighborhoods.

Nikki DiRanna, biology teacher at Centennial High School organized the planting along with students from the Tree People Club who worked for eight months to raise $5,000 to purchase the trees for the two-day event.

More than 200 students participated in the event along with teachers, Mariano Ramirez, history and Mark Monroe, art.

DiRanna wanted the students to recognize that through their actions, they can change their environment for the better.

TREE HUGGERS — Students and teachers at Centennial High School greened up their space by planting 36 trees on campus with the help of TreePeople and biology teacher Nikki DiRanna (far right, on ground).