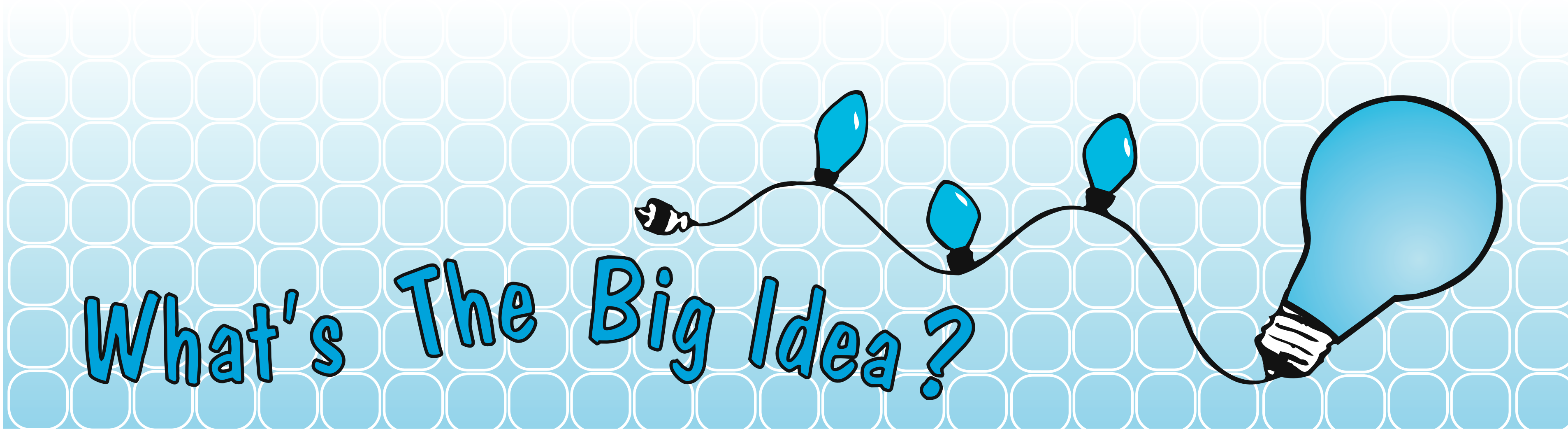

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Start at the Beginning...

(Editor's note: This is second in a series of articles on the "TLC is a PLC." The first article provided an overview of the TLC process. In this article, we focus on the importance of accessing prior knowledge at the beginning of a lesson and carefully selecting a sequence of learning activities which encourage students to explore ideas to maximize their understanding.)

"Begin with the end in mind" is a key mantra from researchers on effective lesson design. What should a student know and be able to do? What does it look/sound/feel like when a student has achieved the learning goal?

The mantra should also include: "And know from whence the student comes." Prior knowledge describes how students think about a learning goal before a learning sequence begins.

A key finding from *How People Learn* (Bransford, 1999) is that students come to classrooms with preconceptions about how the world works. If their initial understanding is not engaged, they may fail to grasp new concepts and information. They may also learn concepts for purposes of a test only and revert to their preconceptions outside the classroom.

What does this mean to your teaching? Simply put, it means that if you don't consider what students think as they enter a learning sequence, you will, most likely, not be able to move them toward the learning goal.

Engagement is more than motivation

During the TLC process, collaborative groups of teachers consider how important prior knowledge is when they design the Engage Stage of the 5E Learning Cycle (Bybee, 1997).

Sometimes this stage is designed to elicit what students remember from a previous lesson so that the new learning sequence can be linked to prior learning. Do students have the prerequisite knowledge/skill to continue their learning about a concept? For example, in a learning sequence that focused on the concept that energy can be transformed, it was imperative that students know there are several types of energy.

Other times, the Engage Stage is used to determine how students are thinking about a concept so teachers can design the best sequence of activities/explorations to move the students to the learning goal.

Let's look at students' understanding of why things sink and float. A simple engage prompt "What makes things sink?" may reveal a range of answers. The response: "Heavy things sink" represents a very different level of prior knowledge than "Something sinks or floats based on relative densities." A student who is thinking about weight/mass needs different learning explorations than the student who already understands the relationship between mass and volume.

Teachers might say they are sure their students have a concept, only to be surprised when students are asked in the Engage Stage to describe their thinking. Recently, an eighth grade TLC team designed a lesson on force and motion which built on the concept they thought their students had clearly grasped: that a force is a push or a pull.

The teachers did not consider what to do if the students didn't have this idea. In a quickwrite, the team simply asked students: "What is a force?" In a class of 32 students, only four had the expected response. The majority of students wrote things like: "It makes you do something (my mother forces me to make my bed)." Some students related the force to Star Wars, "May the force be with you."

The team realized they could not go into the first explore activity they had planned. Instead, they had to quickly design "on the spot" a student demonstration showing how a force acts on an object as a push or a pull and causes the object to move. Once students got this idea, the team continued with the motion explorations.

When the team met next, they decided that instead of being caught off guard, they would explicitly discuss a range of expected student responses to prompts about prior knowledge and plan decision point assessments (DPAs). These assessments are a series of prompts/activities that guide students to the desired understanding.

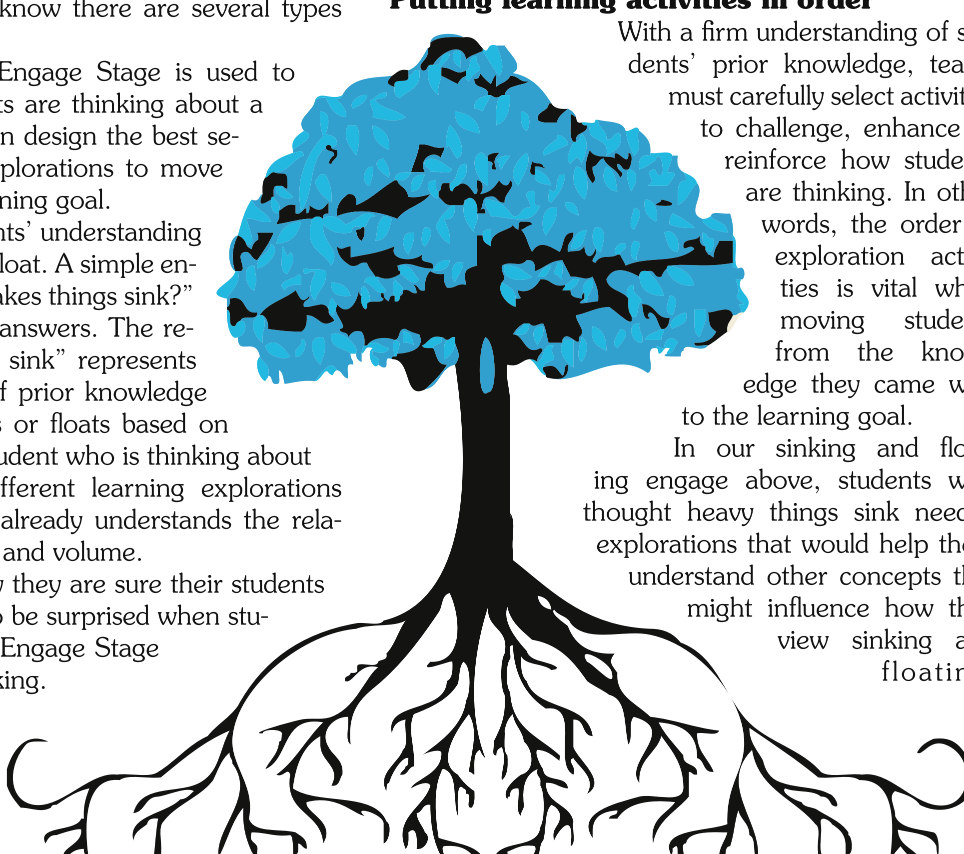
In their next TLC, the teachers expected students to know that plants and animals (including humans) have similar needs so they could explore how these needs are met in the environment. The team recognized that students often struggle with the concept that humans are animals and often lack the knowledge that plants have the same needs as animals; the teachers knew they might have to address this issue.

In a think-pair-share, the students generated a fair list of needs, but struggled with humans as animals and identified more animal needs than plants. The team was ready. They continued with their designed DPAs and conducted discussions on what makes something living and the needs of all living things. Satisfied that the majority of the class was with them, the team helped students begin exploring how these needs are met.

Putting learning activities in order

With a firm understanding of students' prior knowledge, teams must carefully select activities to challenge, enhance or reinforce how students are thinking. In other words, the order of exploration activities is vital when moving students from the knowledge they came with to the learning goal.

In our sinking and floating engage above, students who thought heavy things sink needed explorations that would help them understand other concepts that might influence how they view sinking and floating.



IN THIS ISSUE...

They would need particular activities that would help them see volume as a contributing factor.

Knowing this, the team discussed several activities: two activities would allow students to explore objects with the same volume but different masses; two other activities would allow students to explore objects with the same mass but different volumes.

The team recognized that if they used the first two activities, they would continue to reinforce the student's notion that mass determines sinking and floating. On the other hand, if they selected activities in which the masses were the same but the volumes differ, students would have to address the idea that mass alone does not determine sinking and floating.

The teachers wanted and needed to maximize the limited amount of instructional time, so they chose the latter activities. In the end, student work indicated they had made the right choice. Students whose prior knowledge favored weight/mass were now noting that volume had something to do with the phenomena. They were on track!

A revealing Engage

In another TLC, a fifth grade team designed a learning sequence with a learning goal that plants have a tubular transport system to move water, nutrients and sugars to and from all parts of the plant. Student work (a quick draw/write) from the Engage Stage revealed that students drew a typical plant with roots, stems and leaves and identified sources of water that came from the air, rain and soil.

In addition, the students drew arrows indicating the direction of movement of water in a plant. The placement of the arrows varied depending on where students thought the water came from: water from the air moved down the plant, while water from the soil moved up the plant. Arrows also indicated that plants got nutrients in the form of food from the soil. The drawings revealed possible misconceptions (water into plant through the leaves; "food" rather than raw nutrients from the soil) which would need to be addressed at some point in the unit.

In the first teaching sequence, the team designed exploration activities in the following order, hoping students would change/modify their original drawing to show how plants move water. The team's goal was for students to recognize that plants had a tubular transport system that continued from roots to leaves and was revealed by cross sections of plant stems and roots.

START AT THE BEGINNING, CONTINUED ON PAGE 2

DIRECTOR'S COLUMN

What Matters Most

BY KATHY DIRANNA

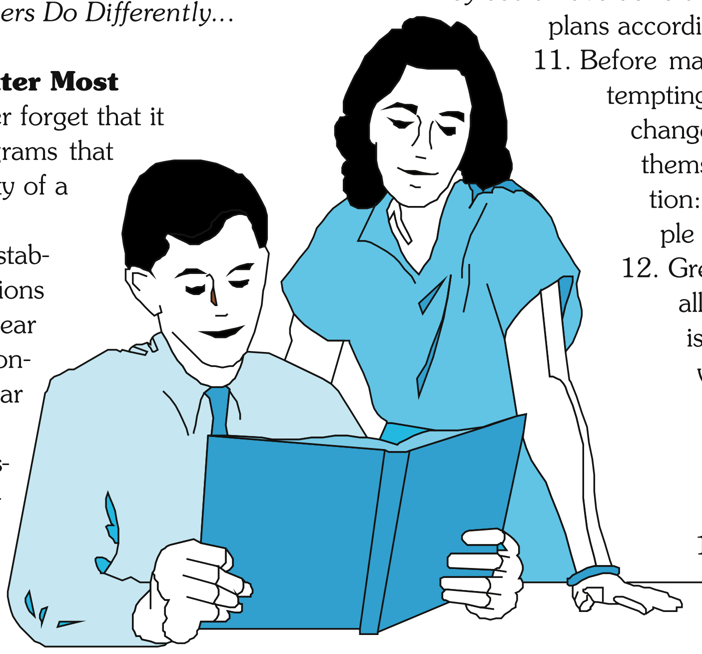
During the January regional director meeting, as we shared professional and personal updates, it became obvious that over the holidays, directors were engaged in activities that mattered most to them: family and friends and building relationships.

Later, as we talked about professional updates, it was also apparent directors spent their energies on what matters most: providing the best professional development that is life-changing and results in optimal teaching and learning.

We then began to think about what matters most to teachers. Our Northern Regional Director Jody Sherriff shared the following from Todd Whitaker's book *What Great Teachers Do Differently*…

14 Things That Matter Most

1. Great teachers never forget that it is people, not programs that determine the quality of a school.
2. Great teachers establish clear expectations at the start of the year and follow them consistently as the year progresses.
3. When a student misbehaves, great teachers have one goal: to keep that behavior from happening again.
4. Great teachers have high expectations for students but even higher expectations for themselves.
5. Great teachers know who is the variable in the classroom: They are. Good teachers consistently strive to improve, and they focus on something they can control—their own performance.
6. Great teachers create a positive atmosphere in their classrooms and schools. They treat every person with respect. In particular, they understand the power of praise.
7. Great teachers consistently filter out the negatives that don't matter and have a positive attitude.
8. Great teachers work hard to keep their relationships in good repair, to avoid personal hurt and to repair any possible damage.
9. Great teachers have the ability to ignore trivial disturbances and the ability to respond to inappropriate behavior without escalating the situation.
10. Great teachers have a plan and purpose for everything they do. If things don't work out the way they had envisioned, they reflect on what they could have done differently and adjust their plans accordingly.
11. Before making any decision of attempting to bring about any change, great teachers ask themselves once central question: What will the best people think?
12. Great teachers continually ask themselves who is most comfortable and who is least comfortable with each decision they make. They treat everyone as if they were good.
13. Great teachers keep standardized testing in perspective; they center on the real issue of student learning.
14. Great teachers care about their students. They understand that behavior and beliefs are tied to emotion, and they understand the power of emotion to jump-start change. ■



This list sounds just like the things K-12 Alliance teachers would say! Thanks to all of you for caring about what really matters in teaching.

START AT THE BEGINNING…, CONTINUED FROM PAGE 1

1. Build a model of how plants transport water using two sizes of straw pipets. Demonstrate how water moves up the smaller tubes by capillary action.
2. Observe celery stalks by both outside observations of stalks and cross cutting stalks. Discuss how this is like model (i.e., that the small straw moves the water and the larger straw doesn't).
3. Use reading and internet pictures to show how plants transport materials and make links to model.

Analysis of student work revealed that only three students altered their original pictures to include tubes. Two students drew cross sections. None of the students removed incorrect arrows (e.g., water into the leaves), but several included arrows to show transport from the soil to the plant. Review of the transcribed lesson indicated that teacher prompts were not on target and that the model was presented before students were curious about how plants move liquids.

For the second teaching, the team decided to resequence the learning activities in hopes of: a) having students experience the real thing before creating a model; and, b) getting more students to alter their original drawings and explanations of plant transport. Their new sequence was in this order:

1. Observe celery stalks in colored water and make cross sections at various places along the stalk. What do you observe? Discuss.
2. Build a model to figure out what is happening in the stalk. Try larger straw…water does not move. Try smaller straw and ask questions about what is different. How is water moving with the smaller straw? Observe celery cross sections. How is the celery structure like the smaller straw?
3. Discuss how the model is like the celery.
4. Read a section of the book and review pictures that explain the capillary action of water.
5. Edit original drawing and writing based on your observations of the celery stalk, the model and the reading.

This time, student work showed that students edited their pictures to add tubes for the transport of materials and used academic vocabulary to label the tubes (xylem and phloem). Most students edited their arrows to show appropriate movement of materials and many students included cross-section drawings. One student exclaimed, "I wish we could experience and read about cool things like this everyday."

The sequence of learning activities connected student prior knowledge with learning goals. In the teacher debrief, the discussion about the order of learning activities also helped to clarify for teachers what was happening in this very traditional "mini lab." Teachers admitted placing celery in colored water for years without really thinking about how the color arrives in the leaves.

In the end, when teachers consider what and how students think before they even enter the classroom, teachers can move them toward learning goals in a more productive and effective manner – that will make learning a joy for everyone everyday. ■

In the next issue, we discuss how the quality and quantity of student responses help TLC teams design for better understanding for all students.

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LEADERSHIP

The K-12 Alliance ‘Village’

BY ERICKA MATTHIES-RESTAD

When I hear the term “educational leader,” I think of a person who helps others learn while continuing to grown in their own leadership. Because of the K-12 Alliance, I have watched true leaders in action and have a good idea of the type of leader I am becoming.

Looking back at my leadership development, I have been blessed to experience a variety of opportunities from a diverse group of educators. I was introduced to the K-12 Alliance while completing my pre-service classes at California State University San Bernardino. My science methods teacher, Karen Cerwin, opened my eyes to the combination of content knowledge, pedagogical strategies and leadership skills that are a recipe for success when it comes to teaching and learning.

Shortly after completing that class, I was hired as an intern by the Lake Elsinore Unified School District. As luck would have it, my new district supported of continued learning for all employees and funded teacher staff development with the K-12 Alliance.

One day, Karen encouraged me to participate in a summer institute as a lead teacher. I jumped on it, but soon found myself intimidated. What could I contribute?

The first training session I didn’t say anything. I sat there absorbing everything like a sponge. Yes, I learned many things, but most of all, the group showed me that everyone has skills they can develop and knowledge on which to build more understanding.

That experience was a profound moment; today, I work to create a similar safe and encouraging learning environment for future leaders.

My responsibilities have grown within the K-12 Alliance. I began as a lead teacher within my school site and then became a staff developer for our school district. When funding was low, I worked to keep our district active in the program, so more teachers could participate.

Today, I wear two hats: staff developer for our district and science content cadre member. Additionally, I have presented at site, district and regional levels. One presentation, however, stands out. I had the recent honor of presenting in Washington D.C. at the National Staff Development Council Conference. Even though it was a daunting experience, I was grateful for the support of leaders in the K-12 Alliance.

Each step of my development has been challenging and rewarding. I approach new tasks with confidence knowing a team of supporters are behind me, helping my progress and celebrating my successes.

We know it takes a village to raise a child, and I believe the same goes with leaders. Because of the nurturing within the K-12 Alliance “Village,” I have achieved far beyond my wildest dreams. Just last year, I received my Masters in Administration.

One day I hope to move out of the classroom and test my leadership abilities as an assistant principal. The K-12 Alliance preaches that everyone is always learning. I am ready to polish my leadership skills even more by working with teachers and professionals. I have seen firsthand what it is like to be a true leader; I look forward to passing on this example to new generations of leaders. ■

Ericka Matthies-Restad is a sixth grade teacher at Elsinore Middle School.

TEACHING & LEARNING

Explicitly Speaking – the 5-E’s

BY JODY SKIDMORE

Being explicit is important in all aspects of our lives. When my house was being built, I asked my contractor for a band of coral tile around the bathtub. In my mind, I visualized a band two tiles wide. What I got was a band one tile wide. I realized I should have been more specific about what I wanted.

All of us have visualized a carefully planned lesson with activities and materials, yet in the middle of the lesson we get responses we didn’t expect. What went wrong? Was it my plan? Were the students ready for this lesson? Did I anticipate student responses? Did I link activities to reveal student thinking and misconceptions?

The 5-E lesson design can help you be very explicit in planning for instruction and anticipating the full range of student responses that reveal misconceptions. Here are things to consider when using the 5Es in your classroom.

When designing a lesson, you will need to determine what concept your students will learn. Not a broad concept, this is a specific concept that anchors the learning sequence.

Once you’ve identified that specific concept, you’ll need to explicitly determine how students will show they know and understand the concept. Carefully craft responses you will expect from your students. After explicitly determining students’ responses, you will design appropriate learning experiences.

In the **Engage** phase (the first E), you will design prompts/activities to discover how much your students know about a certain concept as they connect past and present learning situations.

Next, you will provide concrete and meaningful experiences during the second E, the **Explore**. This phase gives you and your students tangible experiences that can be used later to formally introduce and discuss scientific concepts, processes or skills. Your role is like a facilitator or coach (Bybee, Roger, Achieving Scientific Literacy, Heinemann, 1997, pg. 177).

In addition to providing concrete experiences, you should also have pre-designed questions for students that will enhance and challenge their thinking. By explicitly pre-thinking and pre-designing questions and student responses, you can better coach and guide your students as they begin constructing new explanations (Bybee, pg. 180).

During the **Explain** phase (the third E), your students will clarify how they understand the concept. Your explanations are clearly connected to student explanations and experiences. Students then have opportunities to synthesize all the information, and using a pre-determined assessment, explain their understanding of the concept.

In the fourth phase, students **Extend** their understanding by applying their knowledge to a new situation. If students can transfer their understanding, they are on the path to internalizing new ideas.

The fifth step, **Evaluation**, is intertwined in the other phases. If you had identified the types of students responses that are expected, you can adjust and modify instruction based on those responses.

EXPLICITLY SPEAKING – THE 5-E’S , CONTINUED ON PAGE 4

COLLABORATION

Green Work

BY SUSAN ZWIEP

California is poised to go green. Landmark laws (AB 1548 and 1721) mandate the development of a unified education strategy to bring education about the environment into California’s primary and secondary schools.

Called the Environmental Education Initiative (EEI), this movement involves the California Environmental Protection Agency (Cal/EPA) and the California Integrated Waste Management Board (CIWMB) as active partners.

Other current key EEI partners include: the State Board of Education, the Office of the Secretary for Education, the Curriculum and Supplemental Materials Commission, the State Department of Education, and the California Resources Agency.

Now is the time for districts to think about how to implement these laws into their classrooms.

To date, EEI has developed Environmental Principles and Concepts for elementary and secondary schools which serve as a framework for incorporating environmental education in our schools.

Using these principals and concepts as a foundation, EEI is developing more than 85 curriculum units for grades K-12 in the areas of science, history/social science, and English/language arts. Teachers in 19 school districts throughout California are field testing the EEI curriculum; these units are slated to go before the State Board of Education for approval in 2010.

To help disseminate the program, CIWMB, in partnership with the Cal/EPA, asked the K-12 Alliance to conduct focus group meetings around the state to discover how California school districts and teachers would use the EEI curriculum in their classrooms.

Upcoming focus groups will be held in six locations around the state: San Diego, Los Angeles, Central Coast, Central Valley, San Francisco Bay Area and Humboldt County.

Focus groups are invitational; we hope to include assistant superintendents, directors of curriculum and instruction as well as interested teachers. (If you are want to attend, or know of people in your district who are interested in participating, please email Kathy DiRanna at kdirann@wested.org.)

Based on results from these focus groups and information from a Professional Development survey conducted by the CIWMB, the K-12 Alliance will help design strategies for getting the materials adopted in school districts as well as professional development plans for training district administrators and teachers.

The K-12 Alliance looks forward to this exciting endeavor to re-establish the importance of environmental education as a core curriculum; we understand the urgency and, most of all, we are happy to be doing our part to protect our planet and resources for generations to come! ■

Ask a Cadre: Defining Nature

Recently, a group of teachers were participating in a TLC on ecosystems and discovered they were unclear about the differences between ecosystems, environments, and habitats. After examining these terms on the internet and in textbooks, the team still could not find satisfactory definitions.

Enter Dave Polcyn, biology professor at CSU San Bernardino and cadre member of the K-12 Alliance, who had these answers:

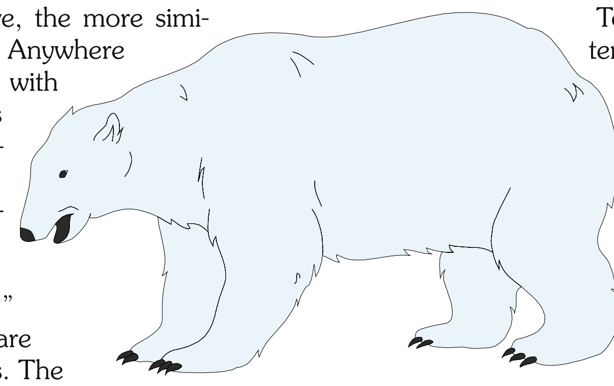
This is a common problem since terms overlap with each other and have various meanings in everyday conversation. Let's start off with "environment."

The formal definition is "all the biotic (living) and abiotic (non-living) factors that affect an individual or species at any point in its life cycle." The first thing to understand is that "the environment" can only be described once you have identified a particular organism (or species). It's like "weight." You can't answer "What does it weigh?" unless you know what object you are talking about; same for defining a particular environment.

Once an organism (or species) is identified, you can discuss its environment which is composed of biotic and abiotic factors. The biotic environment is everything living, was at one point living, or even part of a living organism – plants, animals, bacteria, fungus, etc. Even dead and decaying things are part of the biotic environment.

The abiotic environment is composed of things that never were alive – water, temperature, light, humidity, salinity, etc. Thus, the "human environment" includes all the various biotic components (other humans, the plants and animals we eat, the bacteria and fungi which cause diseases and spoil our food, mosquitoes which bite us, plants which produce our oxygen, etc.) and abiotic components (sunlight, heat, water, atmospheric gasses, etc.) which impact our lives.

In theory, the environment of each species will be somewhat different; the more similar species are in lifestyles and where they live, the more similar their environments will be. Anywhere an organism is, they are faced with an environment; sometimes it's favorable for survival of the organism; sometimes, it's not, but regardless of where an organism finds itself, it is still in an environment.



Now let's discuss "habitat." Like environment, habitats are specific to individuals or species. The formal definition is "the sum of environmental conditions in which an organism or population lives; the place where an organism normally lives; the environment in which the life needs of an organism are supplied."

So, the habitat of an organism is not all the possible environmental conditions an individual might experience; it's restricted to conditions in which organisms can survive and reproduce.

If environmental conditions change drastically, or if you move an individual/species out of its habitat (i.e., out of the conditions necessary for life), it's still in an environment; however, we'd call this a "hostile environment" because it doesn't meet survival needs.

For instance, consider a black bear and a polar bear that both appear (magically) in the Southern California forest. Both bears experience the same environment but, the black bear is in a favorable environment (hence its habitat); but the polar bear is in an unfavorable environment.

Finally, an ecosystem is different (but related) to the terms we've been discussing. The formal definition is "a biotic community and its abiotic environment." It's simply listing all the different species ("the biotic community") that live in a given area, plus the abiotic conditions which characterize that area.

To describe an ecosystem, you must first define an area. Ecosystems can be viewed from a variety of scales – a broad perspective, (the Florida Everglades) and down to a very limited perspective (a drop of water in a rock depression).

Ecosystems are typically defined by the flow of matter and energy between organisms and their abiotic environment. Ecosystems can change over time; for instance, if a single abiotic factor is changed (such as restricting the flow of fresh water into the Everglades), the entire ecosystem could drastically change (the Everglades would become drier; the landscape would become dominated by shrubs or trees, etc.).

Thus, an ecosystem may change so much that although it was once considered "habitat" for a particular species, after the biotic and/or abiotic conditions change it may no longer serve as habitat for that same species -- but will potentially become a habitat for new species.

With this input from Dave, the TLC team designed a learning sequence on the differences between the biotic and abiotic components of an ecosystem. From there, they plan to focus more on a specific animal's environment and how biotic and abiotic factors affect its ability to live in that environment. ■

Coachella Partnerships

The California Department of Education has awarded its Math Science Partnership grants for Cohort 6. We are delighted to be in several of the grants and especially look forward to renewing our Math Science Partnerships for Coachella Valley Unified School District, CSU San Bernardino and College of the Desert.

Success in Understanding Math (SUM) builds on the successful professional development design of the Cohort 1 partnership that addressed science education in grades 4-6. The SUM Project is designed to address five goals: 1) increase teacher content knowledge; 2) enhance teacher pedagogical skill (to include ELL strategies); 3) increase student understanding and achievement; 4) build district capacity through leadership and 5) sustain the synergy of the partnership for future collaboration.

Kevin Erickson and David Budai will spearhead the SUM project in the districts. Both have been active participants in the K-12 Alliance for many years.

Building professional learning communities in mathematics, SUM partners will work with district teachers, community college instructors, university mathematicians and professional development providers.

Partners will also begin to discuss: teaching practices in the mathematics content courses in institutes of higher education; developing new relationships for on-going professional development; and encouraging communities to become active advocates for mathematics education.

Sixty mathematics teachers will participate in more than 94 hours of professional learning each year, impacting the education of more than 2,500 students.

The three basic components of the work plan are: 1) a Summer Content Institute which discusses mathematical issues, pedagogy, standards, instructional materials, lesson design, assessment, best practices, conceptual flow, student notebooks and ELL strategies; 2) TLC lesson study sessions; and 3) after-school sessions which focuses on assessment by analyzing student data and designing classroom interventions.

SUM teacher leaders (six classroom teacher facilitators and two full time district math coaches) will participate in the regular program and in an additional 9-day staff-developer institute focusing on leadership and coaching skills.

This additional program builds district capacity through developing teacher leaders who will serve the district in leadership positions, guide professional development and facilitate TLCs at school sites.

Here's to old friend. We are pleased to be part of the grant that aims to better serve not only our students, but our teachers as they tackle mathematics education for Valley students! ■

Kudos, Kings Canyon!

BY RITA STARNES

Congratulations to CaMSP Cohort 6, Kings Canyon Unified School District!

The K-12 Alliance is delighted to work with Kings Canyon School District for a Cohort 6 Science grant. Located in Central California, the rural school district of Kings Canyon will partner with neighboring Sanger School District, California State University Fresno and the K-12 Alliance to bring science professional development to 45 teachers in grades 3-8.

Kings Canyon teachers have been associated with the K-12 Alliance since 1993 when the Alliance was known as CSIN (California Science Implementation Network). Leading the way in science, Kings Canyon teachers participated as leaders for their schools, staff developers and content cadre members.

The Cohort 6 grant looks forward to Summer Institutes and Teaching Learning Collaboratives (TLCs) that brings together university professors, pre-service students from CSU Fresno and teachers from Sanger and Kings Canyon.

Project director for the grant is Jennifer Weibert who has served with the K-12 Alliance as lead teacher, staff developer and content cadre member. She has coordinated Summer Institutes for her district as well as facilitating numerous TLCs.

Also part of the Cohort 6 grant team will be Marcy Guthrie, Kings Canyon; David Andrews, CSU Fresno; Josie Fierro, Sanger; and Rita Starnes, K-12 Alliance Regional Director. ■

Addendum

In the January issue of *What's the Big Idea?*, we presented Art Navar's leadership story, "Imagining the Possibilities," but inadvertently forgot to include his picture. Here, we'd like to set the record straight and apologize for not running Art's photo by his words.

EXPLICITLY SPEAKING – THE 5-E'S, CONTINUED FROM PAGE 3

The Explain Phase is an especially strong evaluation because students explain their understanding. In addition to teacher evaluation, students should be able to self-assess throughout the lesson.

So, explicitly speaking, the 5-E lesson design is a powerful means to explicit instruction. Using the 5-E design, you can be confident that your students will reap the benefits of a beautifully-planned lesson design – with no surprises ■