

(Continued)

Lynn: Yes, it was also during this era that I became aware of the value of concepts in the design of curriculum. We did identify the kinds of outcomes we wanted for our students in terms of being “quality thinkers” and “collaborators,” but realized that we could best accomplish these ultimate outcomes through a curriculum design that framed critical factual knowledge and skills with related concepts. For the eight years that I served as curriculum director, we developed all of our K–12 curricula in a concept-based format—though we did not write conceptual understandings (statements of relationship between disciplinary concepts) since I had not yet reached that level of enlightenment in my own journey. You know, even though the educational swings over the years seemed to take us off track for a time, each movement brought us something of value that has eventually taken us to a new level of quality curriculum and instruction. Progress is not a straight line.

Today there is a growing realization among educators that curriculum and instruction must move beyond knowledge and skills to include the deeper, transferable understandings realized at the conceptual level of thinking. We believe strongly that there are two paramount reasons for this movement:

As knowledge continues to expand exponentially we must move to a higher level of abstraction (concepts) to focus and process the information so it can be thoughtfully and efficiently accessed and utilized.

Developing the students’ ability to think well in order to solve complex problems and create new ideas requires a more sophisticated curriculum and instruction model—a model which encourages “synergistic thinking.” When a person is thinking synergistically there is a cognitive interplay between the factual and conceptual levels of knowledge and understanding. This interplay stimulates higher order thinking and leads to deeper understanding of both the facts and concepts (Erickson, 2007).

Concept-based curriculum models, by design, deliberately include the conceptual dimension, which is imperative for stimulating synergistic thinking. Concept-based models differentiate clearly between what

students must Know factually, Understand conceptually, and be able to Do in processes, strategies, and skills. Traditional curriculum models refer to what students must Know and be able to Do, but too often fail to highlight Understanding as a third expectation. Perhaps this was because loud voices in the late 1980s and early 1990s said, “Do not use the word *Understand* in curriculum design because it cannot be assessed.” This had a detrimental effect on curriculum design for many years. We still remember teachers during the late 1990s who expressed concern about using the term as we referred to the importance of conceptual “understanding” in our workshops. It is true that it is easier to assess factually specific knowledge, but a myopic allegiance to factual knowledge alone means we remain locked in a lower-level coverage model for curriculum and instruction.

Of course “understanding” can be assessed! Assessment for understanding uses factually specific information to support conceptual understanding, as well as for assessing the quality of thinking brought to the task. Assessments that call for the transfer of understanding through time, across cultures, and across situations also indicate depth of understanding. It is clear that the call for evidence of deeper understanding in education today requires changes in traditional assessment practices.

Synergistic thinking stimulates higher-order thinking and leads to deeper understanding of facts, skills, and concepts.

THE VALUE OF KNOW, UNDERSTAND, AND ABLE TO DO IN CONCEPT-BASED MODELS

A clear presentation of the curriculum components, referred to as KUDs (Know, Understand, and able to Do) in concept-based models benefits the following constituents in the educational family:

Teachers

KUDs provide teachers with clear indicators to guide instruction, but they also . . .

- move teachers along the continuum in understanding the difference between a topic-based versus the concept-based model for teaching and learning by providing quality examples of conceptual understandings that are supported by the factual knowledge and skills.

- raise the bar for instruction by shifting the focus from *covering* facts and skills—to *using* facts and skills to understand concepts and conceptual understandings.
- create alignment between a concept-based pedagogy and the curriculum design that drives that pedagogy. If we want to teach for conceptual understanding then we need to see those understandings articulated to guide our instructional planning.

Students

When teachers design learning experiences that employ KUDs and concept-based pedagogy students will benefit because . . .

- factual knowledge and skills will be processed interactively and iteratively with a related concept or concepts in each student's mind as he or she constructs personal meaning and understanding. This synergistic thinking process develops the intellect and motivates the student for learning. The thinking of each child is valued. For example, inviting students to consider the issue of "Climate Change" through the conceptual lens of "Evidence/Perspectives" puts them in the driver's seat for the inquiry and tells them that the teacher is interested in how they interpret the topic of Climate Change when played against the lenses of Evidence and Perspectives. The students are intellectually and emotionally engaged in the study because they are invited to think for themselves as they consider the factual knowledge in relationship to the conceptual lens.
- collaborative work groups will engage children in the social construction of meaning as they question, discuss, explore, and create products and solutions to interesting problems and issues.
- learning to think beyond the facts and transfer concepts and understandings through time, across cultures, and across situations expands the worldview of students, helps them see patterns and connections between new knowledge and prior knowledge, and provides the brain schemata to support lifelong learning.

Administrators

KUDs provide clear indicators for principals and instructional coaches on what students need to be learning. These indicators, along with the administrator's understanding of concept-based pedagogical requirements, provide the foundation to support each teacher in developing into a master concept-based instructor.

Parents

When curriculum documents clearly indicate what students must know, understand, and be able to do, parents have more complete information to be assured their children are receiving a quality education. When they understand that their children are not only learning critical facts and skills, but are also developing a deep understanding of the underlying concepts, they realize that today's students are learning more than *they* had been taught. By hearing their children talk about concepts and relate factual information to conceptual understandings at the dinner table, they hear the evidence of what their children Know, Understand, and are able to Do.

The following is the recollection of a student, Connor Cameron, now a junior in high school, who experienced learning in a concept-based classroom in his eighth-grade science class. He was describing the project as one he especially enjoyed. Notice how the concept-based instruction kept him motivated and engaged in his learning and what he still remembers after three years. See if you can identify what Connor knew factually, understood conceptually, and was able to do in skills and processes. Where did Connor show evidence of transfer of learning?

My science teacher, Mr. Presho, at Brier Terrace Middle School in Brier, Washington, gave us a project to create a device that could be placed into a fish tank with 18 inches of water and move from the surface to the bottom at least 3 times. After giving that prompt he basically left us to find a creative solution to this problem. I realized that I had to figure out a way to have the submarine raise and lower its average density so it could float and sink in an automated fashion. After having some experience with the process of electrolysis from a previous science fair project, I realized that I could use that process to create a gas while under water. That process would be the mechanism with which I would lower the overall density of the submarine to less than that of water so it would float. To contain these gasses (that I was going to be creating under water) I chose a 2 liter bottle to serve as the housing for my "submarine."

Electrolysis, as shown in the illustration, is the process of running an electrical current through a NaCl (salt) and water solution. What it accomplishes is breaking the bonds of the H₂O molecules into its constituent gasses of two parts H and one part O. What it looks like is just air forming in small bubbles on the metal cathodes.

(Continued)