# Concept-Based Curriculum and Instruction for the Thinking Classroom

H. LYNN ERICKSON

*foreword by* Carol Ann Tomlinson

Hawker Brownlow
EDUCATION

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# Introduction

Complexity. In a globally interdependent world, the concept of *complexity* frames the sociopolitical and environmental issues of the day. Strongly held beliefs and values lead to increasing polarization and conflict. Competing perspectives and ideologies continuously pull in this or that direction.

Educators are charged with preparing students to live and work in this complex, interactive world. Intuitively, they realize that helping students learn to use their minds well must be a major focus for instruction. But even with this realization, they struggle with the realities of educational challenges:

- How can I develop the critical, creative, and conceptual minds of students and still teach the required content?
- How can I meet the expectations of academic standards given the time constraints and the diversity of student needs?
- How do I design curriculum and instruction to truly develop each student's intellect and problem-solving ability?
- Where can I find the time and professional training to prepare myself for the complexities of 21st-century teaching?
- How can I find the time to plan effectively for teaching and learning?

This book provides many answers to the questions—but it requires a mind shift in traditional ways of looking at curriculum design and pedagogy. The insights in this book are grounded in cognitive science, learning theory, and the commonsense reasoning of what works in teaching and learning. My educational journey of 38 years has provided opportunities to teach, evaluate, design, stumble, forge on, and synthesize what works in teaching and learning. For the past 18 years, I have focused my work intensively on curriculum design and instruction at all levels and in all subjects. This book shares the understandings of curriculum and instruction gleaned from my journey. These insights are not frivolous fads or

fanciful musings. They are deeper insights into the inherent structure of knowledge and the relationships among curriculum design, instruction, and the development of intelligence. The following seven findings summarize the insights. The first insight is the primary focus for this book:

1. The key to intellectual development is the *synergistic interplay* between the factual and conceptual levels of thinking. Synergy refers to an interaction where the sum effect is greater than either agent acting alone. Traditional curriculum models generally fail to systematically set up this intellectual synergy. When curriculum and instruction require students to process factual information through the conceptual level of thinking, the students demonstrate greater retention of factual information, deeper levels of understanding, and increased motivation for learning.
2. Traditional curriculum design models fail to provide a strong conceptual structure for the information base. The educational result is a *coverage* curriculum model, which encourages cognitively shallow teaching and learning.
3. Every discipline has an inherent conceptual structure. As the information base expands, these conceptual structures become increasingly important for patterning, sorting, and processing incoming information.

   *The greater the amount of factual information, the greater the need to rise to a higher level of abstraction to organize and process that information.*

4. Though Benjamin Bloom's taxonomy of educational objectives (Bloom et al., 1956) has provided a useful tool to help students perform at different cognitive levels related to a particular topic, it does not directly address the need for students to develop conceptual understanding so they can process factual information at deeper levels and enhance knowledge retention and transfer.
5. National academic standards are *generally* incoherent in their cross-disciplinary design:
   - ♦ Science standards are concept based
   - ♦ Social studies standards are fact based
   - ♦ Mathematics standards are skill based
   - ♦ English/language arts standards are skill based

   This incoherence in design at the national level has led to an incoherence in the design of academic standards at the state level. Each disciplinary set of standards should have an overall conceptual structure, with specific content and skill standards supporting the deeper conceptual structures.
6. In addition to specific content knowledge and skills, a district curriculum needs to clearly articulate the concepts, generalizations, and principles for

each grade level and each discipline. These statements are the essential, enduring ideas that students must *understand* at a deeper level. The factual knowledge is what students must *know* in order to describe, discuss, explain, or analyze the deeper concepts. One cannot understand the conceptual level without the supporting factual knowledge. But there must be a synergy between the two levels if we are to systematically develop intelligence.

7. Educators often wonder why children enter school as eager, motivated learners but become harder to motivate as they move beyond third grade. My theory is that there is an inverse relationship between an expanding fact base through the grade levels and engagement of the child's personal, conceptual mind.

The early primary grade curriculum is far more conceptual than factual. Teachers invite children to put their minds, hearts, and hands to work in understanding concepts like colors, weather, family, fairy tales, and numbers. Children bring their personal intellect to the tasks as they collaborate, create, and problem solve. Each child feels the personal exhilaration of using his or her mind well. Joey loves to learn because he is using his own brain. But Joey moves through the grades and something happens. There is a subtle shift from engaging Joey's conceptual mind to covering the growing body of factual content. Almost imperceptibly at first, Joey begins to lose interest in learning. Teachers think it must be the action video games and sound-bite television programs that are creating the apathy in classrooms. But perhaps it is the "selling out" of personal synergistic thinking to a flatline humdrum of content coverage. As the factual load increases, the conceptual intellectual engagement and consequent motivation for learning decreases. But teachers can fix this design problem with a concept-based model for curriculum and instruction.

We have much work to do in improving education for our young people. Hurricane Katrina, which devastated several states in the southern United States in 2005, is a current example of the need for higher levels of conceptual thinking. We live in a complex age that holds the potential for massive destruction on both the environmental and sociopolitical fronts. Effective responses to complex problems require the abilities to abstract, conceptualize, predict, collaborate, plan, and act accordingly.

Teachers and administrators need significant retraining; curriculum needs to be redesigned; school districts need systems' approaches for organizational effectiveness. These are not new goals for education. They are espoused every year. But why have we not arrived? Could it be that we remain stuck in old design paradigms?

As you read the following chapters, you will compare the excitement of thinking classrooms to the dull throb of mind-numbing, "drill and kill" scenarios. You will come to understand the inherent structure of knowledge and realize the critical nature of that structure for intellectual development. You will see how to design

quality instructional units and lessons for the classroom that contextualize academic standards to realize the deeper intent and to make them more manageable. You will learn how to design and teach for deeper understanding and the transfer of knowledge through a concept-based curriculum and instruction model. Finally, you will consider the leadership role in facilitating the changes outlined in this book. The change process is a journey—not an end point. Across the world, teachers and administrators are at various stages on this journey. I hope this book helps illuminate a teaching/learning path for thinking classrooms.

# The Thinking Classroom

# 1

## CLASSROOM SNAPSHOTS

In an elementary school, the classroom buzzes with activity. Children work in small research and discussion groups, intent on discovering the answer to a question posed by the teacher: "How do simple machines increase work efficiency?" Students collaborate as they hypothesize and design and carry out experiments using levers, pulleys, and ramps. The teacher asks the students to use the concepts of *force* and *energy* to describe the results of their experiments. Students express ideas, question each other, and extend their thinking. New understandings emerge and are recorded in sentences next to drawings of their simple machines. A visual scan of the classroom confirms an active learning environment. Student work lines the walls, and books, art prints, science materials, mathematics manipulatives, and computers are evident in the plentiful workspace.

In a secondary school, students use desktop computers and access databases to find relevant material on global pollution. They process the information through the conceptual lens of *environmental sustainability* as they think beyond the facts. They compare notes with students around the world, and design PowerPoint programs to display their research and deepening understanding of global pollution and sustainability. They scan in pictures to enhance the graphic appeal. These are the students of the computer age, and they produce a score of intellectual, artistic, and informative products.

Down the hall in another classroom, students sit placidly in rows and stare at their textbooks while child after child reads a paragraph. Behind the vacant eyes, minds are playing—outside. The teacher controls the scene from a stool in the front of the room and questions the facts just read. Posters hang on the wall like soldiers at attention, and books sit in tidy positions on the shelves, sorted by size. The room is quiet except for the bored drone of the student reading and the interminable tick of a clock on the teacher's desk.

The art and science of teaching go beyond the presentation of information. Artful teachers engage students emotionally, creatively, and intellectually to instill deep and passionate curiosity in learning. They know how to effectively use the structures offered by the science of teaching to facilitate the personal construction of knowledge. But the personal construction of knowledge is not "whatever." The teachers are clear on what they want their students to know factually, understand conceptually, and be able to do in skills and processes.

What may appear to the casual observer as ill-structured activity in a classroom is actually goal-oriented learning. The teacher has artfully designed the lesson with questions and experiences so that students are building and sharing disciplinary knowledge and understanding aligned to academic standards. The learning is purposeful. But the teacher also designs for learning to encourage the discovery of unintended insights and understandings. The discussion of essential questions, inquiry-based learning, and the encouragement to make meaning and express ideas through art supports this extension. Intellectual development, mindful learning, and creative expression are key instructional goals.

Mr. Howe is a middle school social studies teacher. He has been teaching about early American colonization and wants his students to internalize an enduring understanding of history—that *developing nations may resist or revolt against a ruling country's social, economic, and political policies if they are perceived as unjust.* He developed the following lesson to help students internalize facts supporting this understanding.

> You are a creative designer for Gameboards USA. You have been charged by the president of the company with designing a game to teach fifth graders about the reasons leading up to the American Revolution. Your game must have questions that address the social, political, and economic conflicts between England and the settled colonies.

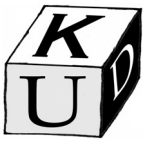
To assess the students' factual knowledge on reasons for the American Revolution, Mr. Howe gave a selected response test. As an extension assignment, Mr. Howe asked students to research the causes of two other political revolutions in history (students chose their revolutions from a teacher-supplied list). Then he assessed their conceptual understanding that *people may revolt against governmental policies that are perceived as oppressive or unjust* through the following task:

> You have studied the causes of the American Revolution and two other political revolutions in history. Working in a cooperative group, create a graphic organizer that compares the causes of the three revolutions. As a group, determine one common factor that led to revolution across the three examples. Individually, choose one of the following formats and illustrate that common factor:
>
> - Political cartoon
> - Newspaper article
> - Poster
> - Poem

Thinking classrooms employ concept-based curriculum and instruction design models. These models are inherently more sophisticated than traditional models because they are as concerned with intellectual development as they are with gaining knowledge.

Concept-based curricular and instructional designs are *three-dimensional*—that is, curriculum and instruction is focused on what students will . . .

- ***K***now (factually),
- ***U***nderstand (conceptually), and
- be able to ***D***o (skillfully).

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Traditionally, curriculum and instruction has been more *two-dimensional* in design (know and able to do)—resting on a misguided assumption that knowing facts is evidence of deeper, conceptual understanding.

The following performance indicators, for example, are typical expectations across state history standards:

- Identify economic differences among different regions of the United States.
- Compare changes in technology (past to present).

These performance indicators are written in the traditional format of content "objectives," with a verb followed by the topic. It is assumed that the ability to carry out these objectives is evidence of understanding; but, as written, they fail to take students to the third dimension of *conceptual understanding* where the deeper lessons of history reside. Students will research and memorize facts about the economic differences in regions of the United States, but the thinking stops there. Try this task to reach the third dimension. Complete the sentences by extrapolating transferable understandings (timeless ideas supported by the factual content):

- Identify economic differences among different regions of the United States *in order to understand that . . .*
- Compare changes in technology (past to present) *in order to understand that . . .*

What do you think the writers of these performance indicators for middle school expected students to understand at a level beyond the facts? Below are some possible endings:

- Identify economic differences among different regions of the United States *in order to understand that the geography and natural resources of a region shape the economy.*
- Compare changes in technology *in order to understand that advancing technologies change the social and economic patterns of a society.*

We cannot just assume that teachers reach the conceptual level of understanding with students. In fact, years of work facilitating the writing of these essential, enduring understandings with teachers has shown me that it is a skill that takes practice. Extrapolating deeper understandings from factual knowledge is not easy work. It involves thinking beyond the facts to the "So what?"—the significant and transferable understandings. It involves mentally manipulating language and syntax so that conceptual understandings are expressed with clarity, brevity, and power. Teachers across the board say, "This is hard work!" when they begin this writing process. The learning curve is steep, but with a little practice, teachers take pride in their finely honed understandings.

Becoming a three-dimensional, concept-based teacher is a journey that merges best practices in teaching and learning with a developing understanding of brain-based pedagogy. But we have much to learn. So let's get on with the journey.

## THE BRAIN AT WORK

The cognitive sciences have produced prolific writers on the anatomy and functioning of the brain (Calvin, 1996; Calvin & Ojemann, 1994; Mandler, 2004) and on the implications for teaching and learning (Gardner, 1999; Novak & Gowin, 1999; Ritchart, 2002; Sousa, 2001; Sternberg, 2002; Sylwester, 2003; Wolfe, 2001).

At the cellular level, the brain is composed of billions of neurons and trillions of glial support cells. Robert Sylwester (2003) describes the brain's macrocomposition as a subcortical area consisting of the brain stem and surrounding systems with "pea- to walnut-shaped modular structures" that control basic brain processes governing survival and emotional needs. Above the subcortical area is the cortex. Sylwester (2003, p. 20) describes the cortex as a "six layer sheet of deeply folded neural tissue . . . that encompasses 85% of our brain, and processes learned rational logical behaviors."

The sensory lobes process relevant incoming sensory information and integrate it into a unified perceptual field. This analysis is then relayed to the frontal lobes for evaluation and action. Pat Wolfe, in *Brain Matters* (2001, p. 42), states, "Our human cortex allows us to build cathedrals, compose symphonies, dream and plan for a better future, love, hate, and experience emotional pain, because it is in the cortex that consciousness—our ability to be aware of what we are thinking, feeling, and doing—emerges."

Other books devoted to the structure and function of the brain provide detailed information related to other parts of the brain, such as the thalamus and hypothalamus, and describe the neural communication process across synaptic divides (Sousa, 2001; Sylwester, 2003, 2005; Wolfe, 2001). But since the focus of this book is developing intelligence through conceptual thinking, a primary function of the cerebral cortex, we will leave the remaining details on the structure and function of the brain to other authors.

It is important to this book, however, to share and affirm an observation by Sylwester (2003, p. 23): "We're used to thinking of intelligence as something that